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REPORT ON WATER POLLUTION CONTROL, SAN JOAQUIN RIVER DRAINAGE BASIN, CALIFORNIA

Public Health Service
San Francisco, California

1953

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Water Pollution Series No. 49

Report on Water Pollution Control

San Joaquin River Drainage Basin

(California)

1953

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DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

Water Pollution Series No. 49

Report on

Water Pollution Control

SAN JOAQUIN RIVER BASIN

California Drainage Basins

Prepared by:

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
U. S. Division of Water Pollution Control
Pacific Southwest Drainage Basins Office

On the basis of information supplied by the:

Central Valley Regional Water Pollution Control Board
(Region No. 5)

January, 1953

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SAN JOAQUIN RIVER BASIN

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INTRODUCTION

The Federal Water Pollution Control Act, Public Law 845, passed by the 80th Congress in June 1948, requires the Surgeon General of the Public Health Service to cooperate with other Federal agencies, with State and interstate water pollution control agencies, and with municipalities and industries in the preparation or adoption of comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof, and improving the sanitary condition of surface and underground waters. Due regard must also be given to improvements necessary to conserve the waters for public and industrial water supplies, propagation of fish and aquatic life, recreational purposes, agricultural and other legitimate uses.

Recognizing the fact that full technical information was not available to permit the development of such comprehensive programs immediately for most of the Nation's waters, the Public Health Service envisioned the development of a series of reports to cover the interim period prior to the development of comprehensive water pollution control programs. The first of these were the Summary Reports, which were prepared for the 15 major drainage basins of the country on the basis of information readily available on July 1, 1950. The second series, of which this is one, are reports on several subdivisions of the major drainage basins. Since development of comprehensive water pollution control programs is to proceed as rapidly as conditons permit, only a limited number of these interim reports are to be made. These reports are intended to provide the following: public information on the water pollution control proolems and needs for the area concerned, a reference point for measuring progress, a guide to needed additional data, and bases for the logical development of comprehensive programs and for approval of loans to States, interstate agencies, and municipalities at such time as the Congress makes available funds for this purpose.

This report for the San Joaquin River Basin was prepared by the California and Great Basin Drainage Basins Office of the Public Health Service. It is based upon data, current as of January 31, 1953, provided primarily by the staff of the Central Valley Regional Water Pollution Control Board of California (Region No. 5)

The report presents information concerning use of water resources, waste discharges to water resources and resulting damages, benefits which may result from pollution prevention and abatement, pollution prevention measures in effect and those needed.

During the course of development of this report the Regional Board's program of detailed study of the various sub-basins in the Region has been in progress and a number of these sub-basin reports have been released by the Board. When all the sub-basin reports for the San Joaquin River drainage area are completed they will serve as the basis for the Board's long-range plans and policies with respect to water pollution control for the entire Basin.

Accordingly, the Regional Board has accepted this report though it will be superseded by the Board's more detailed reports. Meanwhile, it is believed that this report will be of use to state and federal agencies

concerned with the Basin's water resources.

A sincere effort has been made by all who contributed to this report to present complete and pertinent factual data on the water pollution problems in the San Joaquin River Basin. It is believed that reasonable conclusions and recommendations have been drawn thereon. It is hoped that this report, as a step in the cooperative development of an ultimate comprehensive water pollution control program, will help in safeguarding the water resources of the San Joaquin River Basin.

ACKNOWLEDGMENTS

The Public Health Service wishes to acknowledge the assistance and cooperation of those agencies and individuals that have contributed to the preparation of this report.

The assistance of the executive staff of the Central Valley Regional Water Pollution Control Board, in reviewing preliminary drafts of the report and in providing valuable suggestions for improvement, was particularly helpful.

In addition, contributions that were made by the following governmental and private agencies are acknowledged with appreciation:

California Government Agencies

- Department of Agriculture
- Department of Fish and Game
- Department of Natural Resources
  - Division of Forestry
- Department of Public Health
- Department of Public Works
  - Division of Water Resources
- University of California

Federal Government Agencies

- Department of Agriculture
  - Forest Service
  - Soil Conservation Service
- Department of the Army
  - Corps of Engineers
- Department of Commerce
  - Bureau of the Census
- Department of the Interior
  - Bureau of Reclamation
  - Fish and Wildlife Service
  - Geological Survey
  - National Park Service

Private Agencies

- State Chamber of Commerce
- Engineers in private practice
- Individuals interested in water resources

SUMMARY

The San Joaquin River Basin, with a drainage area of about 16,850 square miles, lies in central California and is bounded on the north by the Sacramento River Basin, the east by the Sierra Nevada, the south by the Tulare Lake Basin, and the west by the Coast Range. Spanish colonizers headed by Lt. Pedro Fages and Padre Juan Crespi made the first recorded journey into the Basin and discovered the San Joaquin River, on March 30, 1772, near the present site of Antioch. It was more than fifty years before Jedediah Smith guided the first United States expedition across the Basin. In 1841, upon authority of the United States Congress, the valley was explored by Lt. Charles Wilkes, U. S. N., and further official investigations and surveys were made by John C. Fremont in 1844. Discovery of gold in the adjacent Sacramento River Basin in 1848 resulted in rapid settlement of the foothill country by the forty-niners and of the valley floor by farmers and merchants. The growth of the Basin and of California was so rapid that by 1876 the Basin was traversed by a railroad connecting northern and southern California. In the preceding year the first cooperative irrigation project had been brought to fruition.

Annual precipitation on the level floor of the San Joaquin Valley is light and nearly all of it falls in winter, hence early agriculture was confined to ranching, high-risk dry-farming, or attempts to irrigate bottom land directly from the streams. This type of irrigation, however, was subject to occasional interruption by drought, and organized irrigation became increasingly important to insure an adequate water supply. By 1900 irrigated agriculture was more important than other types of farming. Today the products of irrigated agriculture are the major support of the Basin's economy, and the canning and other processing of these products its principal industry. Mining and lumbering continue to contribute to the area's wealth, and recreation is an important and growing factor. The post-war growth of the San Joaquin River Basin, like that of the entire State, has netted it a gain of about fifty percent in population, some growth in agriculture, and even greater growth in industry and commerce. This expansion has placed new demands upon the Basin's limited water resources.

Water supply is the greatest problem confronting the Basin. Nearly twenty years ago, the State Legislature passed enabling legislation concerning the Central Valley Project, a plan for augmenting the water supply of the San Joaquin River Basin by importing water from the Sacramento River Basin. Construction of the dams and canals envisioned by the Project was initiated in 1937 by the Federal Government. Although irrigation requires much more water than other uses--nearly one and a half million acre-feet of surface water alone annually--other needs for water are of equal importance. Two to two and a half million people derive their municipal water supplies from the Basin. Roughly twenty percent of this population are residents of the Basin, and the others live in the San Francisco-Oakland metropolitan area. Industry, power generation, navigation, wildlife, and fishing are also dependent upon the water

resources of the San Joaquin River Basin. Protection of these water resources against pollution is of vital concern to the Basin's vigorous economy.

Sixty-one municipal and 83 industrial sewers discharge wastes with a population equivalent of nearly 4,000,000 in the Basin. About one-fifth of these wastes, with a population equivalent* of 806,000, are discharged to surface waters. Only ten percent of the latter wastes are of sewage origin and the remainder are industrial wastes, the preponderance of which are discharged by food processing industries in late summer and early fall. This practice is dictated by the nature of the food industry and causes a high seasonal waste load whose effects are aggravated by the fact that the streams experience their minimum flows and their minimum waste-absorbing capacity at this time of the year. The burden of waste entering the streams has been substantially reduced by communities and industries during the past decade.

Shortly after the repeal of prohibition the waste discharges of a number of wineries seriously reduced fishlife in the lower Mokelumne and San Joaquin Rivers. Stimulated by the California Department of Public Health and the Division of Fish and Game, and aided by the California Wine Institute, many of these wineries developed and put to use land disposal methods which greatly improved the condition of these streams. Since 1950 a Fresno County Ordinance, regulating disposal of industrial wastes generally (Appendix, following Table 3) has been the basis for the sanitary control of lagoons for winery wastes and for control of mosquito breeding in such lagoons, by the Fresno County Health Officer. Other food processing industries and a number of communities have, by providing treatment or land disposal facilities, substantially reduced the strength of wastes discharged to the San Joaquin, Tuolumne, and other rivers of the Basin.

Although waste treatment facilities have been provided by all of the Basin's 60 sewered communities and by 74 of its 83 industries, additional prevention measures are needed. Land disposal systems do not, of course, damage surface waters but some of them raise difficult problems of odor and insect control. A few instances of proven damage to surface waters are to be found in the San Joaquin Basin, however. As mentioned in a preceding paragraph, the wastes discharged to surface waters throughout the Basin have a population equivalent of 806,000. Of this, 150,000 is discharged by two municipalities and ten industries whose disposal systems are considered inadequate, and 400,000 by four municipalities and four industries with disposal systems of unknown adequacy. That is, two-thirds of the wastes discharged to watercourses

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*The population equivalent (P.E.) of organic wastes, susceptible to biological treatment, is estimated on the basis that one person produces wastes with 0.167 pounds of 5-day 20° centigrade B.O.D. daily.

are contributed by 20 waste disposal systems which are not considered adequate.* It is perhaps even more significant that the five largest of these 20 systems account for more than half of the biochemical oxygen demand which is discharged to surface waters in the San Joaquin River Basin.

*"Adequacy", as used here, indicates that discharges from those facilities which are classified as adequate have caused no complaints and appear, on the basis of preliminary investigations, to be satisfactory for present conditions. In most cases, however, no special surveys have been made or hearings held as required by California law to determine legally whether "pollution" or "nuisance" is existing or threatened.

CONCLUSIONS

1. Sources of public water supply have not been endangered by waste disposal practices in this Basin.

2. Irrigation is the major water use, in terms of quantity, in the San Joaquin River Basin, but public water supply is of equal importance.

3. The Basin has outstripped its natural water supply and is dependent upon the importation of water from the Sacramento River Basin to satisfy its needs and replace water exported to other basins, hence water pollution control is an economic necessity.

4. The Central Valley Project operates the facilities whereby the bulk of the water imports and exports are made. The Project has already significantly altered the regimen of the Basin's streams, and its full implementation will effect further changes.

5. Ground water is extensively used for municipal, agricultural, and industrial supplies and will remain important despite its projected replacement by imported surface water in some localities.

6. Protection of the quality of underground waters is of major importance because, once damaged, their recovery may require many years instead of days as with surface waters.

7. Waste disposal practices in the mountain recreational areas of the Basin present a minor but growing problem. Some counties are attempting to cope with this situation, but the financing of programs and facilities is difficult in many cases.

8. Growth of the population and economy of the Basin is causing increased domestic, agricultural, industrial, and recreational use of its waters.

9. Conservation of the quality of the Basin's water resources to support their beneficial uses is imperative. Sixty communities in the Basin provide sewage collection.

10. All of the 60 sewered communities in the Basin provide sewage treatment. They operate 61 sewage treatment plants.

11. Fifty of the 61 municipal sewage disposal systems are apparently adequate.*

*"Adequacy", as used here, indicates that discharges from those facilities which are classified as adequate have caused no complaints and appear, on the basis of preliminary investigations, to be satisfactory for present conditions. In most cases, however, no special surveys have been made or hearings held as required by California law to determine legally whether "pollution" or "nuisance" is existing or threatened.

12. Two of the 61 municipal sewage disposal systems are considered to be inadequate.

13. The adequacy of nine municipal sewage disposal systems is undetermined, or not evaluated.

14. Eighty-three industrial waste disposal systems, 74 of which provide treatment, are operating in the Basin.

15. Sixty-six of the industrial waste disposal systems are considered adequate.

16. Thirteen of the industrial waste disposal systems are considered inadequate.

17. The adequacy of four industrial waste disposal systems is undetermined.

18. The domestic and industrial wastes discharged to watercourses in the Basin have a combined population equivalent of about 800,000.

19. In terms of B.O.D., 18% of the wastes entering watercourses is discharged by two municipal and ten industrial disposal systems which are inadequate.

20. In terms of B.O.D., 50% of the wastes entering watercourses is discharged by four municipal and four industrial disposal systems of unknown adequacy.

21. The domestic and industrial wastes discharged to the land in the Basin have a combined population equivalent of about 3,100,000.

22. In terms of B.O.D., less than one percent of the wastes disposed of on land originate from inadequate disposal systems and from disposal systems of undetermined adequacy.

23. The Central Valley Regional Water Pollution Control Board has published a statement of its policy, setting forth the principles and objectives which govern its position on long-range programs and on specific cases of water pollution and waste discharge.

24. The Regional Board is actively surveying the watersheds tributary to the Basin and studying the waste disposal systems which are potential sources of damage to water resources, with the object of formulating long-range plans and promoting corrective measures which may be needed.

RECOMMENDATIONS

1. Communities and industries which have studied their waste treatment problems and have developed specific programs for solving them, and those for which requirements have been prescribed by the Central Valley Regional Water Pollution Control Board should proceed at once with construction of the necessary treatment facilities.

2. The Regional Board's activities dealing with the securing of basic data for specific watersheds and on waste discharges are essential and important and should be continued to permit the Board to develop comprehensive programs for the watersheds of the Basin and to establish requirements for the discharge of sewage and industrial wastes, within the framework of its policy statement and the California statutes.

3. Field studies and the Regional Board's policy of conferring with local authorities and interests to encourage action aimed at correcting the significant sources of pollution in the Basin should be encouraged and continued.

4. The activities of the Regional Board in encouraging local and county agencies to establish water pollution control measures should be continued.

5. The future development of the Central Valley Project should be considered in reviewing discharge requirements and in establishing long range policies for the control of water pollution in the Basin.

6. Local, State, and Federal agencies should cooperate fully in expanding public information programs on the subject of water pollution.

7. Concentration of water pollution control on those waste treatment facilities which are considered inadequate and those of undetermined adequacy should facilitate the pin-pointing of the more crucial sources of waste discharge, and the control thereof.

HISTORICAL BACKGROUND

The San Joaquin River Basin, which drains the south central portion of California's Great Central Valley, was discovered by a Spanish expedition under the leadership of Lt. Pedro Fages and Padre Juan Crespi on March 30, 1772. The discovery was made near the present site of Antioch, and Padre Crespi named the stream Rio do San Francisco. 1/ Alfred Gabriel Moraga gave the river the name it now bears in 1805 or 1806 when he crossed it during one of his many trips through the Central Valley. 2/

Jedediah Smith led the first party of Americans through the San Joaquin Valley in 1827; 3/ 14 years later the first official U. S. exploring expedition to penetrate the interior of California entered the valley under command of Lt. Charles Wilkes, U. S. N. and the maps and reports of that expedition were printed by order of Congress. 4/ An expedition headed by John Charles Fremont entered California, probably via Carson Pass, in February of 1844 and explored the Central Valley in March and April of that year. Maps drawn by Charles Preuss from Fremont's surveys extended the name "San Joaquin" to the major parts of the river, and their present names to its major tributaries. 5/

January 24, 1848 marked the beginning of modern California, for on that day James W. Marshall discovered gold at Coloma in El Dorado County, a few miles north of the San Joaquin River Basin. Within the year, mines were established as far south as Sonora and by the end of 1849 the Argonauts had pushed south to Mariposa and Coarsegold. The following year witnessed the opening of many other gold fields, including those at famed Columbia. Rapid expansion of mining in the fifties was accompanied by the development of more efficient methods. Dredges appeared in the diggings, scooping up rock, mud, and gold and leaving behind serrated piles of boulders which still deface the foothill country. The mud was swept downstream, where, joined by whole mountainsides sluiced away by hydraulic mining, it presented the Basin with its first water pollution problem.

The gold rush carried the seeds of California's next development, which sprouted rapidly in the form of the Pacific Railroad Survey, begun in 1853 at the direction of Jefferson Davis, U. S. Secretary of War. The Survey delineated many of the present transcontinental rail lines as well as the route of the Central Pacific tracks which reached Modesto in November of 1870 and Fresno eighteen months later. 6/ By 1876 the rails extended to Los Angeles; the San Joaquin Valley was the main thoroughfare between northern and southern California.

In 1875 a cooperative enterprise built canals to irrigate lands near Fresno. Irrigation was brought to the lower reaches of the San Joaquin during the eighties, and in that decade protests of farmers against the "slickens"--mud from the hydraulic mining operations--led

Congress to pass the Caminetti Act in 1893, thus creating the California Debris Commission which continues to regulate hydraulic mining in California. 7/

Agricultural production and industries based upon it have gradually supplanted mining as the Basin's major activity. Ever-increasing demands for irrigation water eventually approached the dependable water supply, and the California Department of Public Works was directed to investigate California's water resources with the view of developing a coordinated plan for their conservation and use. 8/ This and subsequent studies laid the groundwork for a State Water Plan which, as adopted by the Legislature in 1929, included the San Joaquin River. 9/ The Central Valley Project, which makes possible the transfer and exchange of water from the Sacramento River Basin to the San Joaquin and from the latter to the Tulare Lake Basin on the south, generally follows the State Water Plan. Since its authorization by Congress in 1935, over 340 million dollars have been spent on the Project, and additional major dams and canals are currently under construction to provide water for continued agricultural and industrial growth.

1/ Bancroft, H. H., "The Works of Hubert Howe Bancroft," volume XIII (History of California, Volume 1), San Francisco, 1884, pages 184-6

2/ ibid, volume XIV (History of California, Volume 2), San Francisco, 1885, pages 47,52

3/ ibid, volume XV (History of California, Volume 3), San Francisco, 1885, pages 155-6

4/ ibid, volume XVI (History of California, Volume 4), San Francisco, 1896, pages 244-6

5/ ibid, pages 438-40, 442

6/ Reports of Explorations and Surveys to Ascertain the Most Practical and Economical Route for a Railroad from the Mississippi River to the Pacific Ocean Made Under the Direction of the Secretary of War in 1853-54

7/ Sumner, F. H. and Smith, O. R. 1940. "Hydraulic Mining and Debris Dams in relation to Fish Life in the American and Yuba Rivers of California." California Fish and Game: 26, 1, 3.

8/ Chapter 832, Statues of 1929, State of California

9/ State of California, Department of Public Works, Bulletin 29 "San Joaquin River Basin," Division of Water Resources, Sacramento 1931

PHYSICAL DESCRIPTION

Geography

The San Joaquin River Basin, with an area of about 16,850 square miles, is part of the Central Valley Water Pollution Control Region and lies in central California south of the Sacramento River Basin, west of the Sierra Nevada crest, north of the Tulare Lake Basin, and east of the Coast Range crest. Calaveras, Madera, Mariposa, Merced, San Joaquin, Stanislaus, and Tuolumne Counties are within the Basin, as are parts of Alameda, Alpine, Amador, Contra Costa, El Dorado, Fresno, Sacramento, and San Benito Counties. See Table A below:

TABLE A

AREAS OF COUNTIES IN THE SAN JOAQUIN RIVER BASIN

County	Area of County (sq.mi.)	Area of County in Basin (sq. miles)	% of County in Basin	% of Basin Represented by the County
Calaveras	1,027	1,027	100	6.09
Madera	2,112	2,112	100	12.54
Mariposa	1,463	1,463	100	8.68
Merced	1,995	1,995	100	11.84
San Joaquin	1,448	1,448	100	8.59
Stanislaus	1,450	1,450	100	8.60
Tuolumne	2,190	2,190	100	13.00
Amador	601	586	98	3.48
Sacramento	983	491	50	2.91
Fresno	5,950	2,643	44	15.69
Contra Costa	714	282	39	1.67
Alpine	776	246	32	1.46
El Dorado	1,737	502	29	2.98
San Benito	1,392	344	25	2.04
Alameda	732	73	10	0.43
Total area of Basin		16,852		100.00

Topographic and Geologic

Most striking of the Basin's topographic and geologic features is the Sierra Nevada, whose crest, which exceeds 10,000 ft. elevation at numerous peaks, separates the San Joaquin River Basin from the Great Basin to the east. The Coast Range, reaching elevations of over 5,000 ft., separates the Basin from the Central Coastal Basin of California, which slopes westward to the Pacific Ocean. By contrast, the northern boundary of the Basin meanders through a tidal delta, shared by the San Joaquin and Sacramento Rivers, which has multiple channels and sloughs with an intricate flow pattern. Some of the delta islands, protected by levees, are below sea level. Separating the Basin from the closed Tulare Lake Basin to the south is a low divide, at about 300 feet elevation.

The San Joaquin and its principal tributaries, the Fresno, Chowchilla, Merced, Tuolumne, Stanislaus, Calaveras, Mokelumne, and Cosumnes Rivers make their major descent in a westerly to southwesterly direction down the Sierra Nevada, curving to a northwesterly to westerly course on the valley floor. These streams have cut deep canyons through several ridges which parallel the Sierra crest. Yosemite Valley, with its waterfalls, cliffs, and domes, is the most widely known.

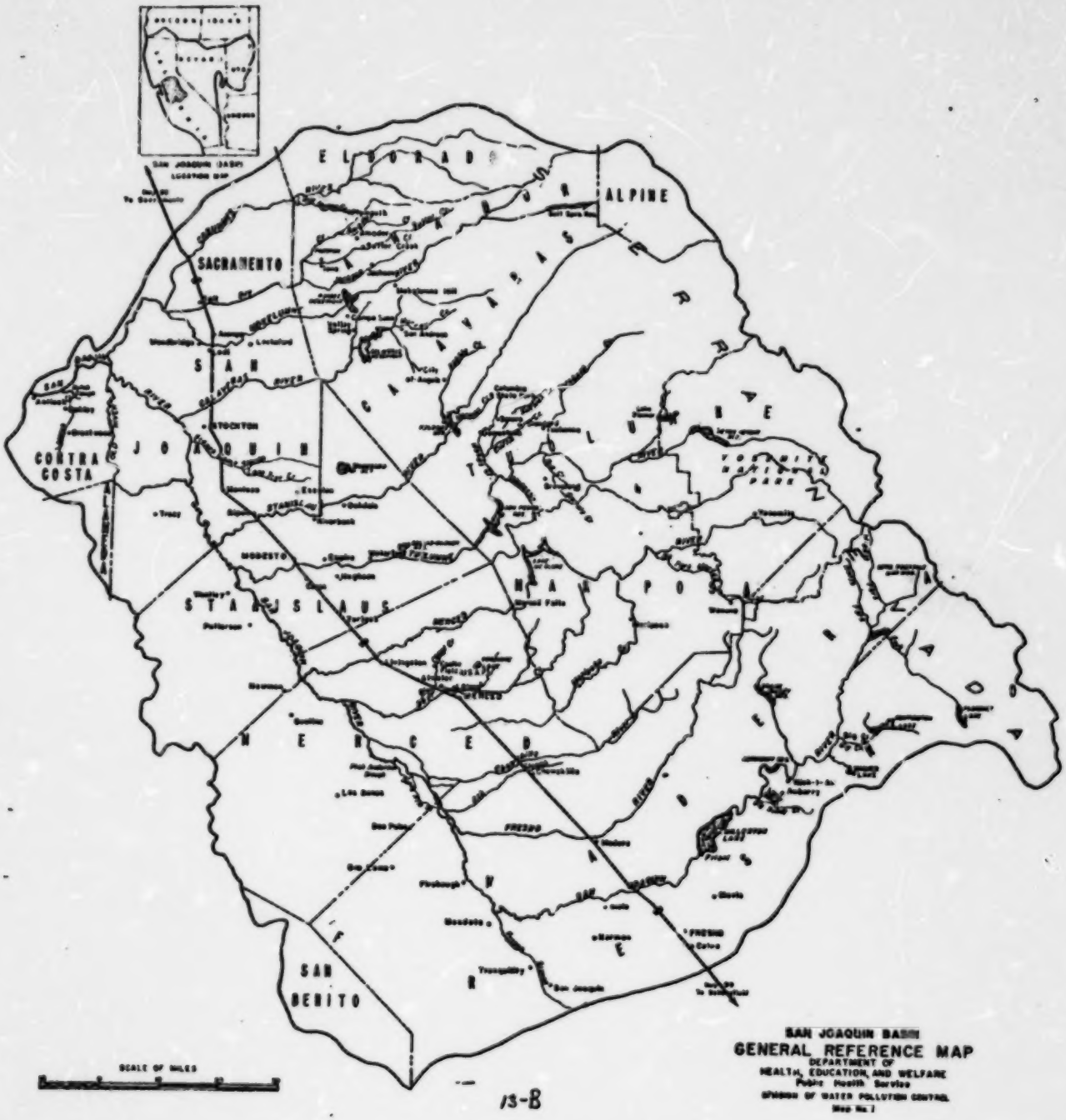
The San Joaquin River, rising at elevations above 10,000 feet in the southeastern part of the Basin, flows southwest until it reaches the valley floor. It then flows west to a point near the center of the valley, where it assumes a northwest course to the Sacramento-San Joaquin Delta. The San Joaquin River has cut a meandering, occasionally multiple channel through the valley floor, a wide, flat alluvial plain which slopes gently from sea level to roughly 500 feet elevation. Above this, the foothills with their rolling country begin abruptly, and become gradually more rugged until, at about 2,500 feet elevation, they merge into the steeper slopes of the Sierra Nevada and the Coast Range.

The Fresno River, rising at about 7,000 feet in the Sierra Nevada, flows parallel to the San Joaquin until it reaches the valley floor, then westerly to the San Joaquin River northeast of Dos Palos. On the valley floor, the Fresno has a wide, sandy channel which is frequently dry in summer. The river drains Madera and Mariposa Counties.

The Chowchilla River, rising at approximately 6,000 feet in the Sierra Nevada, also parallels the San Joaquin to the valley floor, where it has developed multiple channels. The river drains parts of Mariposa, Madera and Merced Counties.

The Merced River, rising at elevations of over 11,000 feet, flows almost due west to the San Joaquin River. The watershed includes Mariposa, Madera, and Merced Counties, and the river flows through Yosemite Valley.

The Tuolumne River, rising from glaciers and small lakes on Mt.



SAN JOAQUIN BASIN
GENERAL REFERENCE MAP
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Public Health Service
DIVISION OF WATER POLLUTION CONTROL

13-B

Lyell and Mt. Dana on the eastern boundary of Yosemite National Park, flows southwest to join the San Joaquin River ten miles west of Modesto. The river drains Tuolumne and Stanislaus Counties.

The Stanislaus River is formed by the confluence of its North, Middle, and South Forks at an elevation of about 950 feet, seven miles north of Sonora. It follows a meandering, generally southwest course and joins the San Joaquin River about three miles northeast of Vernalis. The watershed includes parts of Tuolumne, Alpine, Calaveras, Stanislaus, and San Joaquin Counties.

The North and South Forks of the Calaveras River, rising at elevations somewhat over 5,000 feet, meet near San Andreas, whence the Calaveras River flows southwest to its junction with the San Joaquin west of Stockton. The river drains parts of Calaveras and San Joaquin Counties.

The Mokelumne River rises at elevations of about 10,000 feet in the Sierra Nevada Mountains. Its North, South, and Middle Forks unite near Electra to form the main stem. The river then flows southwest through its canyon for about 35 miles, and westward across the valley floor to the San Joaquin River near Central Landing. The Mokelumne watershed drains parts of Alpine, Amador, Calaveras, San Joaquin, and Sacramento Counties.

The Cosumnes River, rising at about 7,700 feet in the Sierra Nevada, flows southwest to its confluence with the Mokelumne River near the delta, about six miles west of Galt. The river drains parts of El Dorado, Amador and Sacramento Counties.

Geological studies indicate that the rock masses which form the Sierra Nevada were submerged beneath an ancient ocean for over 300 of the past 500 million years. During this period marine sediments and volcanic flows accumulated, and in the succeeding 100 million years an ancestral range similar to the present Appalachian Mountains was thrust above the sea and eroded to low, rolling hills. A 60 million year cycle of repeated uplifting and faulting, interspersed with volcanic action, then raised the Sierra to substantially its present height about 12 million years ago, and in the past million years four successive ice ages combined with stream erosion have shaped the Sierra Nevada. 1/

The Coast Range crest, on the western border of the Basin, is lower and more rounded; the hills more rolling and less rugged. The streams of the Coast Range have shallower slopes than do those of the Sierra, and few of them maintain perennial flow.

Climate

The valley floor has warm, dry summers and mild, relatively dry winters. The surrounding mountains, also generally warm and dry in summer, have severe winters.

Precipitation is heavier in the northern and higher parts of the Basin; ranging from over 50 inches annually on the Sierra Nevada crest in the northeast to less than six inches on the valley floor in the south (see Table B).

TABLE B

MEAN ANNUAL PRECIPITATION AT VARIOUS STATIONS IN THE SAN JOAQUIN RIVER BASIN

Station	County	Station Elevation (feet)	Length Record (years)	Mean Precipitation in Inches Jan.	Mar.	May	July	Oct.	Dec.	Annual
Fresno	Fresno	277	63	1.79	1.58	0.39	0.01	0.58	1.53	9.46
Madera	Madera	296	45	2.04	1.73	0.35	T.	0.49	1.53	9.92
Merced	Merced	173	73	2.33	1.85	0.47	0.01	0.49	1.79	11.19
Stockton	San Joaquin	20	74	2.61	1.93	0.37	T.	0.61	2.48	13.22
Antioch	Contra Costa	46	66	2.63	1.87	0.40	T.	0.60	2.41	12.45
Sonora	Tuolumne	1,825	37	6.53	5.78	1.44	0.01	1.71	5.22	32.91
Yosemite	Mariposa	3,983	41	6.59	5.26	1.37	0.22	1.89	5.27	34.14

Hydrology

Annual precipitation and runoff in the San Joaquin River Basin vary between one-fourth and twice the average.(see Tables B and C). Nearly all of the precipitation falls in winter when the lower and middle slopes of the Sierra Nevada receive both rain and snow, which maintain substantial stream flows until early summer. Late summer and fall flows are dependent upon the slowly melting snow pack of the higher elevations. Table C shows average natural stream flows for the San Joaquin and its major tributaries, but it should be re-emphasized that only a small part of the total annual flow occurs in late summer and fall when the peak discharges of organic wastes are made. Full analysis of stream flows is beyond the scope of this report, but detailed and voluminous hydrographic data are available in the publications cited below. 2/3/4/

Much of the valley floor is underlain by unconsolidated steam-laid deposits, from a few feet to several hundred feet in depth, containing relatively high portions of permeable sand and gravel, which act as extensive ground water reservoirs. In hydraulic continuity with the streams, they yield water freely to adequately developed wells and are quickly replenished by runoff from the mountains. Part of the ground water used for irrigation in the valley is drawn from these aquifers.

An extensive body of clay confines water in underlying permeable aquifers beneath much of the western part of the San Joaquin Valley within the basin. These aquifers are replenished locally along the western margin of the valley and from the alluvium on the east side of the valley. As these confined aquifers receive little or no water from surface

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TABLE C

NATURAL RUNOFF OF MAJOR SAN JOAQUIN RIVER BASIN STREAMS

River	Location of Gauging Station	Average Annual Runoff in Acre-feet 7 year ave.-1927-28 to 1933-34 inclusive	Average Annual Runoff in Acre-feet 40 year ave.-1903-04 to 1942-43 inclusive
San Joaquin	Friant	1,060,000	1,820,000
Fresno	Adobe Ranch	45,000	120,000
Chowchilla	Buchanan Dam Site	35,000	100,000
Merced	Merced Falls	570,000	1,020,000
Tuolumne	La Grange	1,150,000	1,900,000
Stanislaus	Knights Ferry	680,000	1,200,000
Calaveras	Jenny Lind	70,000	200,000
Mokelumne	Clements	440,000	770,000
Cosumnes	Michigan Bar	170,000	370,000

Taken from Bureau of Reclamation, "Central Valley Basin", (Senate Document 113, 81st Congress, 1st Session), Washington, 1949.

water bodies or from rainfall in the valley, their replenishment is slow. It is in these aquifers, tapped by the deeper irrigation wells, that some of the more critical ground water shortages have occurred.

1/ Matthes, Francois E., "The Incomparable Valley", U. C. Press, Berkeley and Los Angeles, 1950. Chapter 1, pages 33-65.

2/ State of California, Department of Public Works, Division of Water Resources, "Report of the Sacramento-San Joaquin Water Supervision for 1950", Sacramento, 1951. (Published annually, since 1929, by the Department of Public Works. Refer also to earlier and subsequent editions.)

3/ U. S. Department of the Interior, Geological Survey, "Surface Water Supplies of the United States, 1949--Part II, Pacific Slope Basins in California", (Geological Water Supply Paper No. 1121), U. S. Government Printing Office, Washington, 1950. (See page 8 for identification of earlier USGS papers, reporting flow measurements for these streams, published annually since 1899.)

4/ State of California, State Water Resources Board, "Water Resources of California", (Bulletin No. 1), California State Printing Office, Sacramento, 1951. pages 307-479.

ECONOMIC DEVELOPMENT

California's rapid post-war growth has been shared by the San Joaquin River Basin, whose population increased 56 percent between April 1940 and April 1950--from 462,000 to 722,000, as shown in Table D:

TABLE D

POPULATION OF THE SAN JOAQUIN RIVER BASIN, BY COUNTIES

County	April 1, 1940 POPULATION		April 1, 1950 POPULATION		Percent Increase
	County*	Basin	County*	Basin	
Calaveras	8,221	8,221	9,902	9,902	20.4
Madera	23,314	23,314	36,964	36,964	58.5
Mariposa	5,605	5,605	5,145	5,145	-8.2
Merced	46,988	46,988	69,780	69,780	48.5
San Joaquin	134,207	134,207	200,750	200,750	49.6
Stanislaus	74,866	74,866	127,231	127,231	69.9
Tuolumne	10,887	10,887	12,584	12,584	15.7
Alameda	513,011	654	740,315	944**	44.3
Alpine	323	81	241	61**	-24.7
Amador	8,973	8,969	9,151	9,146**	2.0
Contra Costa	100,450	13,665	298,984	40,673**	197.6
El Dorado	13,229	2,256	16,207	2,764**	22.5
Fresno	178,565	119,120	276,515	184,457**	54.8
Sacramento	170,333	12,807	277,140	20,837**	62.7
San Benito	11,392	434	14,370	547**	26.0
Total		462,074		721,785	56.2
Population		April 1, 1940		April 1, 1950	
State of California		6,907,387		10,586,223	53.3
United States		131,669,275		150,697,361	14.5

*U.S. Department of Commerce, Bureau of the Census, U.S. Census of Population: 1950, Vol. 1, Number of Inhabitants, Chapter 5: California, U.S. Government Printing Office, Washington, 1951, pages 12-13.

**Figure for 1940 estimated from 1940 census data, Figures for 1950 estimated on assumption that proportion of county population ir the Basin was the same as that in 1940. Of the estimated 722,000; 278,000 were urban and 444,000 were rural dwellers.

Large scale cattle ranching was the initial basis of the Basin's economy, but the gold rush drew great numbers of miners, whose demands for food resulted in additional agricultural activity which grew so rapidly that its value soon surpassed that of mining. After a disastrous drought in 1863-64 caused heavy losses of cattle, dry farming of wheat and barley became the most important farming endeavor. By 1900, the development of other grain regions had caused the decline of high-risk dry farming and irrigated agriculture came to the fore.

Today the major supports of the San Joaquin River Basin's economy are vegetables, fruit, cotton, field crops, livestock, dairy products, and nuts; all dependent upon irrigation. 1/ The canning and processing of these products is the leading industry. 2/

Lumbering, recreation, mining, and commercial fishing are also factors in the economy. Lumbering, based upon the Ponderosa Pine, Douglas Fir, White Fir, and Sugar Pine forests of the Sierra Nevada started during the gold rush days and is still important. 3/ Recreation becomes increasingly important as the west coast gains population. Many thousands of fishermen, hunters, and tourists are attracted to the Sierra Nevada, and providing for their accomodation is an important segment of the Basin's economy. Gold mining reached its greatest importance in 1852 and has gradually declined since. During World War II the gold mines were closed, and few have been revived; sand and gravel, pumice, natural gas, mercury, clay, and Portland cement are now the principal mineral products. In addition to sport fishing within the Basin the San Joaquin River and its tributaries provide spawning grounds which support Commercial and Sport fishing in San Francisco Bay and in the adjoining coastal waters as far north as Oregon and Washington.

Average 1949 per capita income was $1,365 in counties lying wholly within the Basin, and $1,535 in its other counties. 4/ The value of manufactured products, number of manufacturing establishments, and number of production workers has increased greatly since 1940. 5/

1/ See Tables 4, 5, and 6, Appendix

2/ See Table 7, Appendix

3/ See Tables 8 and 9, Appendix

4/ See Table 10, Appendix

5/ See Table 7, Appendix

USES OF WATER RESOURCES

In the San Joaquin River Basin water is scarce and, therefore, important. Expansion of the Basin's industry and agriculture is directly dependent upon the quantity and quality of its limited water supply.

Irrigation is the largest water use; approximately 1,412,000 acre-feet of surface water from over 400 diversions were used to irrigate 476,000 acres of land in 1949. In addition, a large quantity of ground water is used for irrigation; serious overdrafts, causing greatly lowered water tables and increased pumping costs, have occurred in some areas.

The San Joaquin River Basin is the source of water for municipal water supply systems which serve approximately 2,200,000 people, a fifth of the entire population of the state. Roughly 80 percent of the people dependent upon the Basin for their domestic water supply are residents of the San Francisco Bay area. They comprise about three-fourths of the Bay area's population.

Somewhat over 400,000 people in 59 communities of more than 200 population are served by public water systems, 43 of which serve 374,000 consumers with untreated ground water. One small system draws water from both ground and surface sources and provides chlorination prior to distribution. The other 15 communities use surface water; six of them, which serve 21,000 people, provide chemical coagulation and chlorination; eight serving 7,000 provide chlorination only; and two small systems have no treatment. (See Table 3, Appendix.)

Surface water is exported by two municipal systems which serve 1,500,000 to 2,000,000 residents of the San Francisco-Oakland metropolitan area. Filtration and chlorination are provided by one system, chlorination only by the other.

Many of the Basin's process industries obtain their water from municipal systems; others have private supplies. There are 28 hydroelectric power generation plants with a total rated capacity of about 682,000 kilowatts. Twenty-one of these, with over 560,000 kilowatts capacity, are privately owned.

Navigation is of continuing importance in the delta area. The U. S. Corps of Engineers maintains a 30-foot channel permitting ocean vessels to sail up the San Joaquin to the Port of Stockton, which handled traffic amounting to about 925,000 tons and 16,000 passengers annually between 1939 and 1949. The Mokelumne River Navigation Project provides a channel from the mouth of the river to the Galt-New Hope Bridge. Its average annual traffic between 1939 and 1949 was about 41,000 tons. A 9-foot channel, which roughly parallels Middle River through the San Joaquin River Delta, was completed in 1937, and its yearly traffic from 1939 to 1949 was approximately 90,000 tons of

freight and 11,000 passengers. About one-third of the channels authorized in Old River by the River and Harbor Act of 1937 are complete and support annual traffic esimated at 175,000 tons and 8,200 passengers.

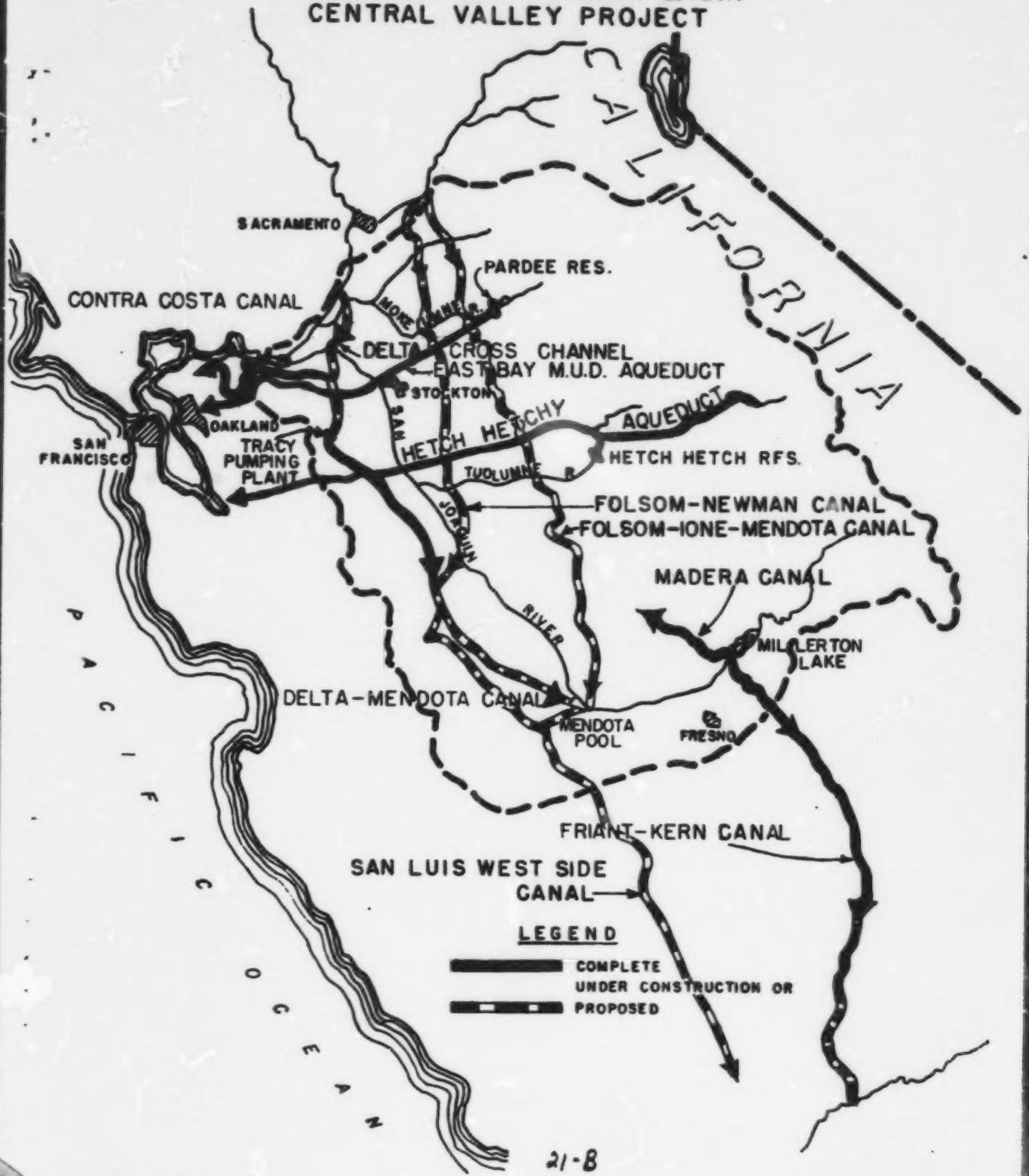
The streams and lakes of the San Joaquin River Basin are intensively fished; trout, striped bass, and salmon are highly prized game fish. The sport fishery for striped bass is particularly important in the lower reaches of the San Joaquin River itself, and spiny-rayed fishes and catfish also provide much sport. Catfish and several rough fishes are also taken commercially. Grassland and marsh areas in the west side of the valley near Newman and Firebaugh, and in the delta northwest of Stockton, provide cover for migratory waterfowl and other game birds. Wildlife resources in lower reaches of the Basin are heavily used because of their proximity to the large population centers.

Recent growth--agricultural, industrial, and urban--has been made possible by conserving and importing water. California's need for planned water use was recognized in 1886 when the State Legislature authorized and paid for canal surveys in the Sacramento Valley. Fruitful action for the San Joaquin Valley, however, stems from the 1921 Legislature's authorization of a complete inventory of the State's water resources and a preliminary general plan for water conservation and use. This and subsequent investigations culminated in the State Water Plan 1/, which was presented to the Legislature by the Division of Water Resources in 1931, and which was the basis for a subsequent Legislature's enactment of the Central Valley Project Act of 1933 2/.

Briefly, the Central Valley Project is a coordinated plan to fully utilize the water of the Central Valley by impounding spring floods for use during the dry summer months, and by transferring excess water from the Sacramento River to water deficient areas in the basins of the San Joaquin, Kings, and Kern Rivers, and of Tulare Lake. Power for pumping the transported water is generated at several of the dam sites. Additional important aims of the Project include the maintenace of sufficient flow in the lower Sacramento River to permit summer navigation and to prevent undue encroachment of saline tidal waters into the Sacramento San Joaquin Delta. Funds for initial construction were provided by the Federal Government under the Emergency Relief Appropriations Act of 1935, and construction was begun by the Bureau of Reclamation in 1937.

The following units of the Project, either complete or under construction, are wholly or partly within the San Joaquin River Basin and will greatly affect its hydrology. Friant Dam, on the San Joaquin River approximately 20 miles northeast of Fresno, impounds Millerton Lake, which provides 520,000 acre-feet of storage and feeds the Madera and Friant-Kern Canals. The latter can transport a maximum of about 7,900 acre-feet per day to farm lands in the Kings and Kern River Basins and the Tulare Lake Basin. The Madera Canal serves over 190,000 acres of land near Madera, and has a capacity of 2,000 acre-feet per day. The Contra Costa Canal can carry about 700 acre-feet of water per day from the delta to the San Francisco Bay area, where it supplies irrigation,

CONSTRUCTION STATUS OF CANAL SYSTEM AFFECTING SAN JOAQUIN BASIN CENTRAL VALLEY PROJECT



21-B

Map No. 2

municipal and industrial water. (See Map 2.)

To replace this and other water exported* from the Basin, excess water from the Sacramento River is diverted into the San Joaquin Basin via the Delta Cross Channel, the Tracy Pumping Plant, and the Delta Mendota Canal. The Delta Cross Channel conveys water across the delta through natural and artificial channels to the Tracy Pumping Plant near Tracy, where large pumps are capable of lifting about 8,800 acre-feet of water per day 200 feet into the Delta Mendota Canal. This 117-mile canal empties into the San Joaquin River near Mendota. Water diverted at Friant is thus replaced for downstream use and, in addition, farm lands on the west side of the valley are irrigated from the canal itself.

In some areas, imported surface water will replace ground water for irrigation and, in others, it will be used to replenish ground water.

The Central Valley Project has radically altered water flow and use patterns; it will effect further changes when dams and canals now under construction or authorized are completed. Even a brief discussion of this multi-basin development is beyond the scope of this report, but its operation, construction, and plan of development have been described in other publications. 3/ 4/ 5/

---

* In addition to the water exports resulting from the Central Valley Project, the 93-mile East Bay Municipal Utility District Aqueduct transports water from Pardee Reservoir on the Mokelumne River to the cities and industries on the eastern shore of San Francisco Bay, and the City of San Francisco is supplied from Hetch Hetchy Reservoir on the Tuolumne River via the 137 mile Hetch Hetchy Aqueduct. The combined capacity of the two aqueducts is about 490 acre-feet per day.

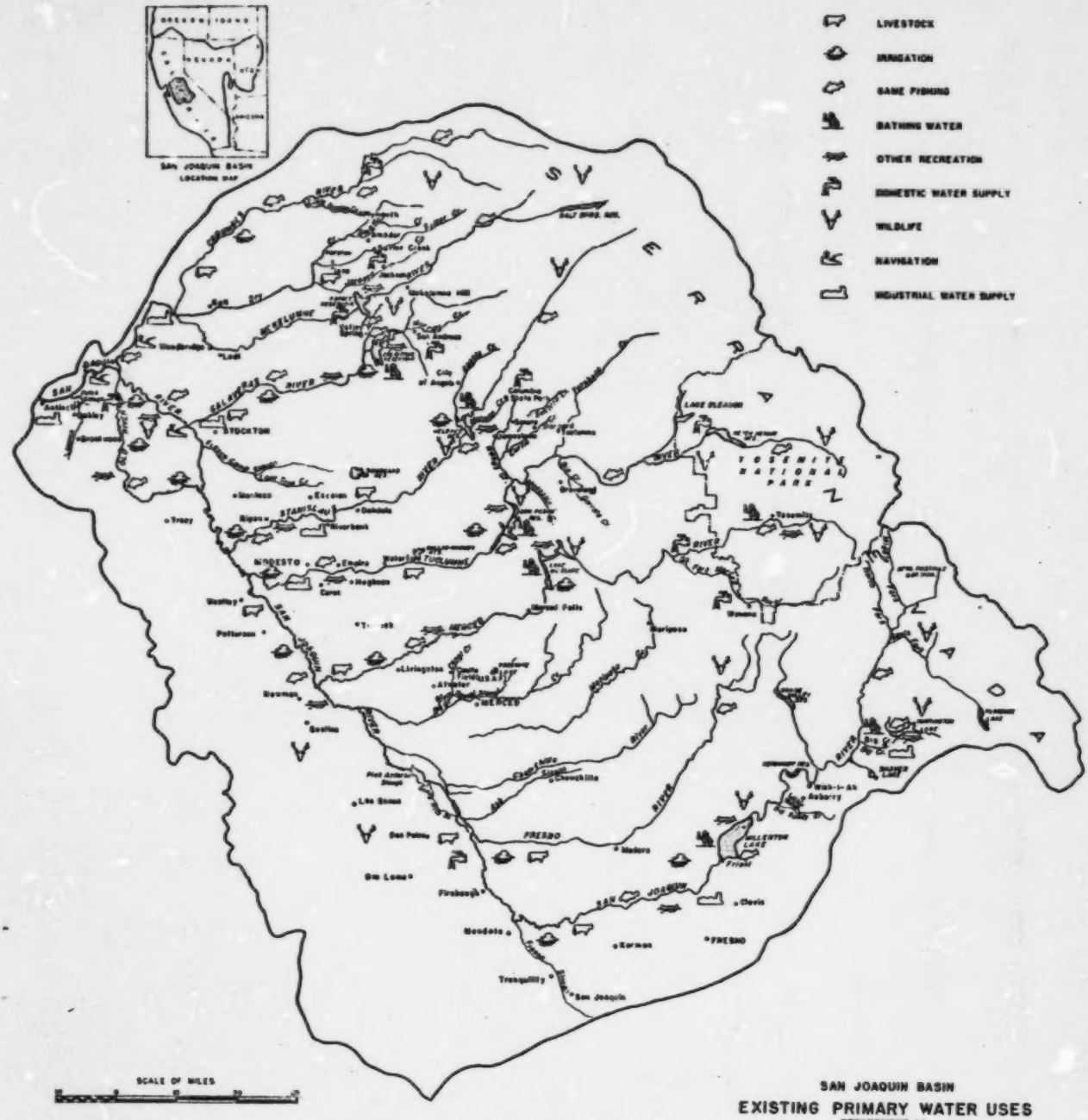
1/ State of California, Department of Public Works, Division of Water Resources, Bulletin No. 25, "Report to the Legislature of 1931 on State Water Plan", California State Printing Office, Sacramento 1931.

2/ Chapter 1042, Statutes of 1933; now, as subsequently amended, codified as Division 6, Part 3, Water Code of the State of California.

3/ U. S. Department of the Interior, Bureau of Reclamation, "Central Valley Basin" (Senate Document 113, 81st Congress), U. S. Government Printing Office, Washington 1949.

4/ The President's Water Resources Policy Commission, Report, Volume 2, "Ten Rivers in America's Future", Part 1, No. 2, pages 81-158, U. S. Government Printing Office, Washington, 1950.

5/ Water Project Authority of the State of California, "Feasibility of State Ownership and Operation of the Central Valley Project" (Bulletin No. 2), California State Printing Office, Sacramento, 1952.


LIVESTOCK
IRRIGATION
GAME FISHING
BATHING WATER
OTHER RECREATION
DOMESTIC WATER SUPPLY
WILDLIFE
NAVIGATION
INDUSTRIAL WATER SUPPLY
SAN JOAQUIN BASIN
LOCATION MAP
SCALE OF MILES
SAN JOAQUIN BASIN
EXISTING PRIMARY WATER USES
DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
Map No-3
STOCKTON
MODESTO
MERCED
FRESNO
YOSEMITE NATIONAL PARK
LAKE PLEASANT
SAN JOAQUIN
FRESNO

23-B

POLLUTION CONTRIBUTED TO WATER RESOURCES

Sixty-one domestic and 83 industrial sewers in the San Joaquin River Basin discharge wastes with a population equivalent* of nearly four million, of which 806,000--20 percent--are discharged into watercourses. The remaining wastes, having a PE* of 3,113,000 are disposed of on land and much of it sinks into the ground, where it eventually reaches ground water. Table E summarizes these data which are fully presented in Tables 1 and 2, Appendix.

Available data on the strength of the raw wastes and discharged effluents of the 23 municipal and 23 industrial disposal systems discharging into watercourses are condensed in Table F. The wastes reported include peak loads of the several industries. Table F indicates that the 23 municipal systems discharge wastes with a PE of 296,000, which is 37 percent of the total BOD discharged to water. Only 19 percent of the municipal load is sewage, hence less than 10 percent of the total pollutional load borne by the streams is from domestic sewage and over 90 percent is from industrial wastes.

More than two-thirds of the peak BOD load discharged to water courses flows from the five municipal and industrial outfall sewers listed in Table G.

TABLE E

SUMMARY OF SEWAGE AND INDUSTRIAL WASTE DISPOSAL IN THE SAN JOAQUIN RIVER BASIN

Disposal Made by	P.E. of Untreated Wastes			P.E. Discharged to		
	Domestic	Industrial	Total	Water	Land	Total
Municipalities	358,830	1,498,800	1,857,630	295,765	478,840	774,605
Industries 1/	N.D. 2/	N.D.	N.D.	510,000	2,634,530	3,144,530
TOTAL	-	-	-	805,765	3,113,370	3,919,135

1/ Includes four municipal industrial waste treatment plants.

2/ "N.D." means not determined.

*The population equivalent (PE) of industrial waste is calculated on the assumption that each person produces one-sixth pound of 5-day 20° C BOD daily.

TABLE F

SYNOPSIS OF THE EXISTING TREATMENT AND DISPOSAL OF SEWAGE AND INDUSTRIAL WASTES DISCHARGED TO WATERCOURSES IN THE SAN JOAQUIN RIVER BASIN

Treatment	MUNICIPAL				P.E. of Discharged Wastes	Total
	Number of Discharges	P. E. of Untreated Wastes				
		Domestic	Industrial	Total		
Secondary	14	119,500[1]	945,800[1]	1,065,300[1]	260,440[2]	
Primary	9	59,900[1]	0 [1]	59,900[1]	35,325[2]	
Municipal Sub-total	23[3]	179,400[4]	945,800[4]	1,125,200[4]	295,765[5]	295,765[5]

INDUSTRIAL

	Number of Discharges		P.E. of Untreated Wastes				
	Food	Other	Food [6] Industries	Other [7] Industries	Total		
Treatment Provided	8	6	N.D.[8]	N.D.	N.D.	117,300[9]	
No Treatment	6	3	82,200	310,500	392,700	392,700[10]	
Industrial Sub-total	14	9	N.D.	N.D.	N.D.	510,000[11]	510,000[11]

TOTAL P.E. DISCHARGED TO SURFACE WATER FROM KNOWN SOURCES 805,765[5/11]

1/ P. E. of raw wastes treated by one community disposal system is unknown and is omitted from this figure.
2/ P. E. discharged from one community disposal system is unknown and is omitted from this figure.
3/ Twenty-two communities, including one with two treatment plants.
4/ P. E. of raw wastes treated by two community disposal systems is unknown and is omitted from this figure.
5/ P. E. discharged by two community disposal systems is unknown and is omitted from this figure.
6/ Includes related industries: wineries, vegetable oil producers, and renderers.
7/ All industries not under "Food".
8/ "ND" means not determined.
9/ P. E. discharged by two industries is unknown and is omitted from this figure.
10/ P. E. discharged by one industry is unknown and is omitted from this figure.
11/ P. E. discharged by three industries is unknown and is omitted from this figure.

TABLE 6

THE FIVE LARGEST SOURCES OF WASTE DISCHARGE TO WATERCOURSES IN THE SAN JOAQUIN RIVER BASIN

Source	Location	Stream Affected	P. E. Discharged	% of Total BOD Discharged to Surface Waters in the San Joaquin River Basin
Fibreboard Company San Joaquin Division	Antioch	San Joaquin R.	200,000	24.8
City of Stockton, South Plant	Stockton	San Joaquin R.	144,000	17.9
Fibreboard Company	Antioch	San Joaquin R.	110,500	13.7
City of Modesto	Modesto	Tuolumne R.	84,000	10.4
Western California Canners, Inc.	Antioch	San Joaquin R.	50,000	6.2
Sub-total			588,500	73.0
41 other discharges			217,265	27.0
Total 46 discharges			805,765 PE	100.0

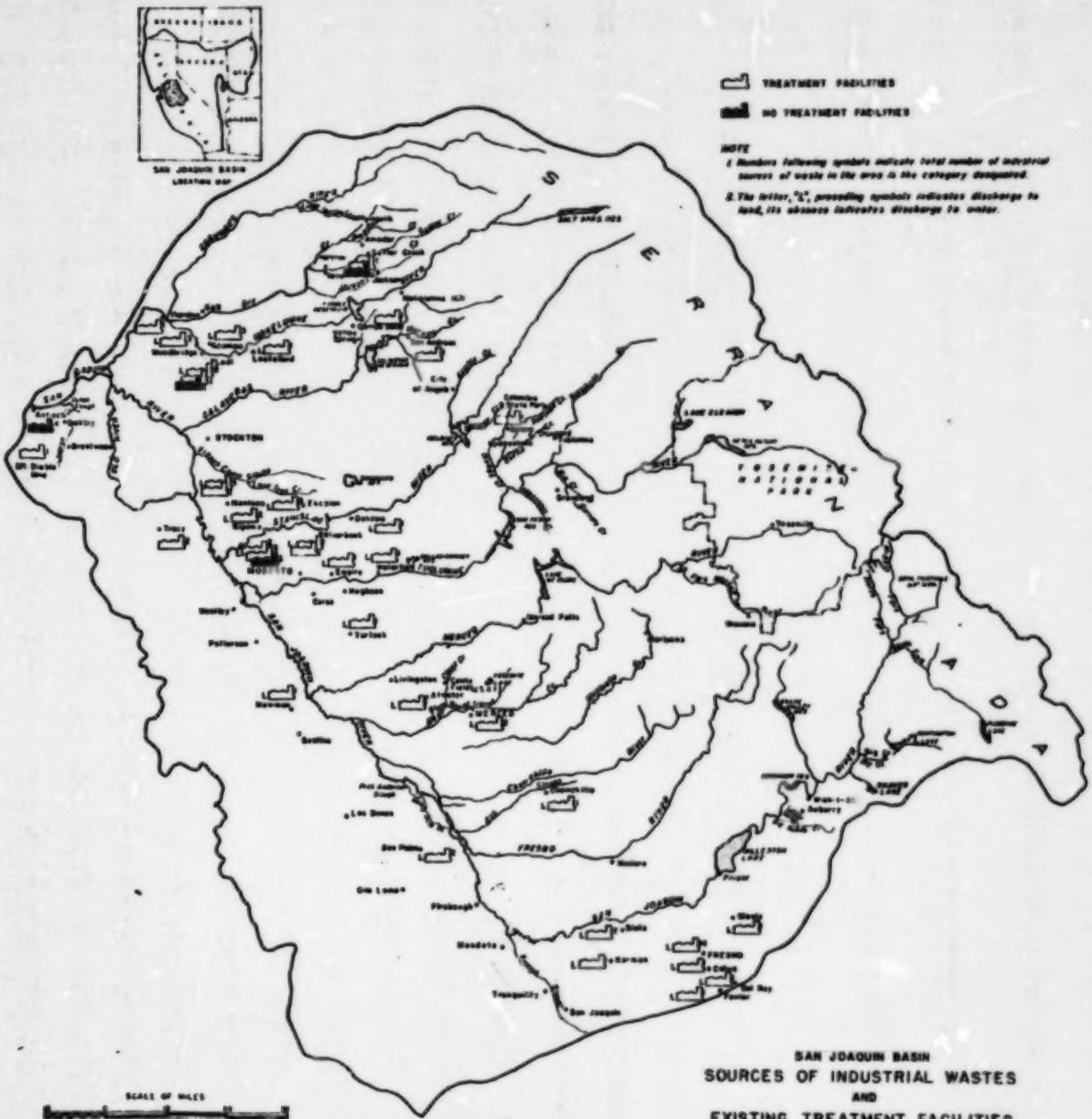
The above table presents the five largest sources in order of size, but this is not necessarily the order of their importance. Downstream water use and the flow available for dilution are extremely important factors which bear heavily upon the extent of pollution that results from a discharge.

Instances of continual serious pollution in the San Joaquin Valley are relatively few, and the condition of the Tuolumne River below Modesto, which is discussed in the next section on damages from pollution, is among the more critical examples. The San Joaquin River and its adjoining sloughs near Stockton suffer excessive oxygen depletion with somewhat less regularity. Some of the smaller communities, faced with declining wealth, have problems which are technically simple but financially quite difficult. Accidental or emergency discharges, and spills from land disposal areas occasionally cause temporary pollution.

Discharges entering mountain streams from campgrounds, summer homesites, and other recreational sources, have not been estimated. However, due to the rapidly increasing recreational use of the mountains, expecially the Sierra Nevada at elevations above 4,000 feet,

multiple small discharges of sewage to mountain streams are likely to result excepting in those areas where adequate sanitary supervision is available from state and local health and water pollution control authorities.

Thirty-eight municipalities and 60 industries discharge wastes with a peak load of 3,113,000 PE to land in the San Joaquin River Basin, according to the available data which are summarized in Table H. Wastes having a PE of 479,000, 15% of the total discharged to land, come from municipal sewers. Sewage is only 2% of the municipal waste load, and hence it is estimated that less than five percent of the BOD discharged on land in the San Joaquin River Basin is of sewage origin.


TREATMENT FACILITIES
NO TREATMENT FACILITIES
NOTE
1. Numbers following symbols indicate total number of industrial sources of waste in the area in the category designated.
2. The letter, "S", preceding symbols indicates discharge to land, its absence indicates discharge to water.
SAN JOAQUIN BASIN LOCATION MAP
STOCKTON
FRESNO
SCALE OF MILES

SAN JOAQUIN BASIN

SOURCES OF INDUSTRIAL WASTES

AND

EXISTING TREATMENT FACILITIES

DEPARTMENT OF

HEALTH, EDUCATION, AND WELFARE

Public Health Service

DIVISION OF WATER POLLUTION CONTROL

Map No. 3

27-B

TABLE H

SYNOPSIS OF THE EXISTING TREATMENT AND DISPOSAL OF SEWAGE AND INDUSTRIAL WASTES DISCHARGED TO LAND IN THE SAN JOAQUIN RIVER BASIN

MUNICIPAL

Treatment	Number of Discharges	Population Equivalent of Untreated Wastes			P. E. of Discharged Wastes	Total
		Domestic	Industrial	Total		
Secondary	9	36,100	71,500	107,600	11,840	
Intermediate	2	5,900	4,400	10,300	2,900	
Primary	24	136,030	477,100	613,130	462,900	
Minor Municipal	3	1,400	0	1,400	1,200	
Sub-total	38	179,430	553,000	732,430	478,840 1/	478,840

INDUSTRIAL

	Number of Discharges		P.E. of Untreated Wastes			P.E. of Discharged Wastes	
	Food	Other	Food Industries 2/	Other 3/	Total		
Treatment Provided	60 4/	0	N.D. 5/	0	N.D.	2,634,530 6/	
Industrial Sub-total	60 4/	0	N.D.	0	N.D.	2,634,530 6/	2,634,530

TOTAL P. E. DISCHARGED TO LAND FROM KNOWN SOURCES 3,113,370 1/

1/ P. E. discharged from two primary plants is unknown and is omitted from this figure.
2/ Includes related industries: wineries, vegetable oil producers and renderers.
3/ All industries not under "Food".
4/ Includes four municipal industrial waste treatment plants, serving sixteen factories.
5/ "N.D." means not determined.
6/ P. E. discharged from eleven industrial waste treatment plants is unknown and is omitted from this figure.

DAMAGES TO WATER RESOURCES FROM POLLUTION

Water pollution in the San Joaquin River Basin is seasonal, occurring in late summer and early fall when stream flows are at their annual low and the food processing industry is booming. The existence of "contamination"* has in no case been officially determined, although health hazards resulting from sewage discharges are suspected to be chronic in the vicinity of several foothill and mountain villages. Only small quantities of inorganic wastes are discharged and no existing pollution is positively attributed to them, but vigilance sufficient to prevent the occurrence of this type of pollution from the expanding chemical, metal, and other heavy industries will be worthwhile. The danger of silt pollution can be minimized by proper attention to debris dams and tailings ponds--both active and inactive--which, if neglected, may fail and spill their impounded tailings. Salinity of the delta waters, resulting from sea water intrusion, has affected less than ten percent of the delta farmlands since efforts to control it by releasing water from Shasta Dam began in 1943.

Wastes from fruit and vegetable canneries have caused most of the damage to surface waters in the Basin during recent years. Peak discharges of the wastes occur in late summer and early fall, when flow in the streams reaches its annual minimum. Along with the fact that the maximum waste discharges coincide with minimum stream dilution capacity, all of the salmon streams experience their spawning runs at this very time. The Tuolumne River below the City of Modesto offers an example.

The canning industry at Modesto began on a small scale in the early 1920's and grew so rapidly that, by 1939, Modesto ranked 13th among California cities in the dollar value of manufactured products. Pollution of the Tuolumne River below the city became so serious in 1946, despite the prior installation of screens at each cannery, that the dissolved oxygen content of the river was insufficient to maintain the salmon run. Consequently, the California State Division of Fish and Game obtained a court order enjoining the city and its industries from continuing to pollute the river. Industrial operations were curtailed as much as 60%, work schedules were staggered, and the discharge of wastes coordinated with releases of water, stored for irrigation, from upstream dams. In the succeeding years, despite the joint efforts of industry and the city to curtail unncessary discharges and provide treatment works, nesessity for a repetition of industrial curtailment was avoided only by again releasing irrigation water to dilute the wastes. 1/ The City of Modesto has extensive treatment facilities,

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* "Contamination", as defined by law in California, means "...impairment of the quality of the waters of the State by sewage or industrial waste to a degree which creates an actual hazard to the public health through poisoning or through the spread of disease..."

which, in 1951, were unofficially said to be capable of removing nearly 85 percent of the BOD from its peak-load wastes. Even so, the Tuolumne River was heavily polluted by the discharges from Modesto during the canning season of 1952.

Manteca has a similar problem in that the combined effluents from its separate industrial waste and sewage treatment plants, during the peach canning season of 1950, caused complete oxygen depletion in the water of an irrigation canal which receives the effluents. Both Manteca and Modesto are attempting to improve their treatment and disposal methods to reduce pollution and free themselves from annual complaints of nuisance and pollution.

Cities and industries in the vicinity of Stockton, Tracy, and Antioch are fortunate in having larger stream flows which provide more dilution than Modesto enjoys. Tidal action, especially at Stockton, has at times proved disadvantageous by causing discharged effluents to oscillate up and down some of the delta channels. This phenomenon is not constant, and may be the result of unfavorable combinations of stream flow and tide stages.

A threat of future silt pollution exists in the dams and tailings ponds which now impound mine and mill tailings along several streams. Many of these dams are timber structures and should they fail in a period of heavy runoff serious damage to reservoirs, irrigation ditches, and aquatic life can be expected. 2/ Large volumes of silt discharged by early hydraulic mining operators were swept into the valley, where they choked river channels and irrigation ditches. The former became too shallow for navigation or adequate flood carrying capacity, the latter were filled and made useless.

Water becomes unfit for irrigation when its salinity, expressed in terms of chlorine content, exceeds 100 parts per 100,000 (1,000 ppm). 3/ A small part of the delta area is nearly always faced with salinity higher than this, the result of the encroachment of sea water from San Francisco Bay into the delta channels. Prior to 1943, natural runoff was the principal factor governing the extent of salt water intrusion, but since that time the flow of water into the delta has been subject to regulation by controlling the quantity of water released from Shasta Dam. Records show that, since 1920, 10 percent or more of the farm lands in the San Joaquin River Delta were affected by river salinity greater than 1,000 ppm of chlorine in the following years: 1924, '26, '31, '34, and '39. It is noteworthy that the maximum interval between these occurrences is five years, which would lead to the expectation of a recurrence by 1944, or shortly thereafter, despite a four-year period of above normal runoff, 1940-43 inclusive. 4/

It appears likely that the controlled release of water from Shasta Dam to maintain adequate flow through the delta, which began in 1943, is the reason that salt water intrusion on this scale has not recurred.

The minimum 10-day flow through the delta, since 1943, was 5,270 cfs (in 1947). In each of the years when as much as 10 percent of the San Joaquin River Delta was affected by salinity, the minimum 10-day flow through the joint deltas was below 2,100 cfs. 4/

1/ Report of the Interim Fact-Findings Committee on Water Pollution, Assembly of the State of California, Sacramento, August 1949. pages 61-2.

2/ Paul A. Shaw and John A. Maga, "The Effect of Mining Silt on Yield of Fry from Salmon Spawning Beds", Pollution Detail, California State Division of Fish and Game, Sacramento, January 1943.

3/ "Report of Sacramento-San Joaquin Water Supervision for 1950", State of California, Department of Public Works, Division of Water Resources, Sacramento, 1951. pages 37-8.

4/ ibid, Table 196, page 180.

BENEFITS RESULTING FROM POLLUTION PREVENTION AND ABATEMENT

Past and continuing pollution abatement measures have greatly moderated pollution of the Mokelumne River, the San Joaquin, and the delta channels since 1939. Pollution of the lower Tuolumne, though less severe and less likely to extend into the San Joaquin than it was even five years ago, remains serious. An increasing awareness of their responsibilities by municipalities and industries is an encouraging step forward, which should help insure future progress. A recently enacted State law, designed to prevent the contamination of underground waters, forbids the construction, maintenance, or use of any sewer well extending to or into a subterranean water-bearing stratum that is used or intended to be used as, or is suitable for, a source of water supply for domestic purposes.* This should make it possible to maintain the valley's priceless ground water at a high quality. Another 1949 statute is intended to protect surface waters used for municipal supplies from contamination by houseboats.**

Winery wastes which, after 1932, were discharged to the Mokelumne River in such quantities that the salmon run declined rapidly, no longer cause serious pollution.

In the early 1930's, with the repeal of prohibition, the Bureau of Sanitary Engineering of the California Department of Public Health, which was then the state water pollution control agency, undertook a survey of wineries in the state and of their waste disposal practices. For several years the Bureau conducted an active program with the industry to secure satisfactory control of these wastes. It also cooperated with the Division of Fish and Game which had concern in the matter because of the effect upon fish life of winery wastes discharged to streams. Since 1950 the Fresno County Health Department has exercised control of industrial waste discharges in their county through a permit system authorized by a county ordinance.

Winery wastes have a relatively high BOD and their production, beginning in September with the early grape harvest, coincides with both low stream flows and the salmon spawning runs, depleting the dissolved oxygen content of the water and thus driving the salmon away. 1/ In 1935 virtually no salmon appeared in the Mokelumne River, and in 1937 the California State Division of Fish and Game prohibited the continued disposal of still slops and other strong winery wastes into the river. A highly successful program to find a better disposal method was initiated by the California Wine Institute, an association of the wine industry. Most of the winery wastes in the San Joaquin River Basin are

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* State of California Health and Safety Code, Division 5, Part 2, Chapter 4, Article 2, Sections 4457 and 4458.

**ibid, Sections 4457 and 4459.

now disposed of on land, and many wineries which are in or near vineyards irrigate them with the wastes. The latter practice protects the streams and returns valuable mineral and organic constituents to the soil. In addition, disposal by broad irrigation prevents the odor nuisance which develops if percolation or oxidation ponds become anaerobic, and reduces the demand upon ground and surface water sources.

Stream pollution from other food processing industries has been significantly reduced since 1940 as a result of joint action by California State agencies and industrial associations. Before that, it was common practice to discharge cannery refuse, including solid wastes, to watercourses at Modesto, Stockton, and in the delta. In 1939, several companies in the latter area provided adequate treatment and incidentally reclaimed their solid wastes in a form suitable for stock feeding. Although pollution of the Tuolumne River below Modesto continues, despite the city's provision of treatment facilities which are said to be capable of removing as much as 85 percent of the influent BOD, it is evident that a vastly more serious condition would exist if the wastes were discharged raw. Stockton has also built extensive treatment works and thereby greatly alleviated pollution of the lower San Joaquin. Both Stockton and Modesto are actively working on improvement of their treatment facilities.

Suitably treated domestic sewage is used for irrigation, but the California State Department of Public Health has issued rules governing its use. 2/ When properly disposed of on the ground surface, both sewage and organic industrial wastes--i.e., of animal or vegetable origin--relieve the demands upon natural water sources, and aid in replenishing ground water. Such wastes, unless they are excessively mineralized, can be discharged on the land surface without seriously jeopardizing ground water because microscopic flora and fauna, occurring naturally in the soil, attack and thrive upon organic matter just as similar organisms do in the filters of sewage and waste treatment plants. Bacteria present in sewage are hindered from reaching ground water by several factors. 3/ 4/ An intensive study of the underground travel of pollution is being made by direction of the State Water Pollution Control Board.

The mountain counties, now primarily dependent upon the tourist and resort trades, are learning that insanitary sewage disposal practices repel vacationers and sportsmen. In consequence, there is increasing awareness of unsatisfactory conditions and growing interest in doing something to correct them. Mariposa County has faced this problem by engaging a full-time sanitarian. Periodic inspection of unsatisfactory disposals, coupled with reminders and education, should lead to corrective action.

The mosquito control measures carried on in the San Joaquin River Basin result in significant public health benefits and are closely related to the pollution prevention activities. The Bureau of Vector Control of the State Department of Public Health conducts an active

program in the San Joaquin River Basin for mosquito control. In addition continuing mosquito control operations are carried on in the Basin by many county Mosquito Abatement Districts.

A primary objective of these programs is the control of Culex tarsalis, the mosquito vector of encephalitis. During the 1952 outbreak of this disease in California over 500 cases of encephalitis were reported between June 1 and September 5, most of them in the Central Valley. Standing flood waters, ponded irrigation waters and sewage oxidation lagoons provide breeding places for mosquitoes.

The efforts of State and county authorities in reducing mosquito breeding in the waste lagoons through application of insecticides and control of weeds and other vegetation, are therefore of significance in reducing the Culex tarsalis population and of benefit to the public health .

1/ "Pollution of Mokelumne River by Winery Wastes" by Paul A. Shaw - Published in SEWAGE WORKS JOURNAL, vol. IX, No. 4, July 1937.

2/ State of California, Department of Public Health, Special Bulletin No. 29, "Regulations on the Use of Sewage for Irrigating Crops", California State Printing Office, Sacramento 1933.

3/ Interim Fact-Finding Committee on Water Pollution "Report of the Interim Fact-Finding Committee on Water Pollution", Assembly of the State of California, Sacramento, 1949, pages 138-9.

4/ "Present Economic and Technical Status of Water Reclamation from Sewage and Industrial Wastes", (Technical Bulletin No. 4), Sanitary Engineering Research Project, University of California, Berkeley, March 1951, pages 19, 20.

POLLUTION PREVENTION MEASURES IN EFFECT

All of the 60 communities in the Basin have sewage treatment facilities and 74 of the 83 industrial sewer systems treat their wastes before discharge. Wastes reaching municipal treatment plants have an overall P. E. of 1,858,000 whereas these wastes as discharged, after treatment, have a P. E. of 775,000. This represents an overall reduction in strength of 58% through treatment.

The portion of municipal wastes that are discharged to watercourses have a P. E. of 1,125,000 as they reach the treatment plants and 296,000 as discharged to watercourses--a reduction in strength, through treatment, of 74%.

Industrial waste strength figures are incomplete and no conclusions regarding the effectiveness of their treatment can be drawn, but those reaching watercourses have an estimated P. E. of 510,000 and the total estimated strength of industrial wastes regardless of point of discharge is 3,145,000 P. E. These figures on industrial waste strengths do not include those handled by municipal sewage systems.

Table F shows that the 22 communities which discharge their wastes to watercourses have provided 14 secondary treatment plants which have a combined effect of 76% BOD reduction, and nine primary plants which reduce the influent BOD by 41% before its discharge. Fourteen of the 23 industrial sewers discharging to watercourses provide treatment, but the data available do not permit quantitative evaluation of their effectiveness. Qualitatively, it may be pointed out that all of these treatment facilities remove gross solid matter and many remove grease and oil which, if discharged to the streams, not only cause unsightly conditions but also impose appreciable demands upon their oxygen resources.

Table H shows that all of the 38 municipalities discharging their domestic wastes to land provide treatment before final disposal. Nine have secondary treatment plants which effect an average BOD removal of 89%, two provide intermediate treatment which reduces the influent BOD by 72%, and 24 with primary plants achieve an overall BOD reduction of 25%. The other three have minor treatment--principally screening--and remove about 14% of the influent BOD. The 60 industrial sewer systems which discharge to land all provide treatment, but lack of data makes estimation of its effectiveness impossible. In general, those land discharges which are not satisfactory are the source of odor nuisance. No pollution or contamination is known to have been caused in the Basin from the disposal of wastes on the surface of the ground.

Table 1, Appendix, indicates that 50 of the 61 municipal treatment plants are considered adequate and two inadequate; the adequacy of seven is undetermined and that of two has not been evaluated. As used here, "adequate" indicates that a discharge so rated has occasioned no official complaints and appears, on the basis of preliminary investigation,

to satisfactorily protect the existing stream or disposal site uses. No formal investigations or hearings have been held to determine officially whether contamination, pollution, or nuisance exists.

The California State Legislature, in its 1949 regular session, enacted the legislation under which water pollution control is exercised in California. This legislation, which consisted of eleven acts, included the following definitions: "'Contamination' means an impairment of the quality of the waters of the State by sewage or industrial waste to a degree which creates an actual hazard to the public health through poisoning or through the spread of disease. 'Contamination' shall include any equivalent effect resulting from the disposal of sewage or industrial waste, whether or not waters of the State are affected." "'Pollution' means an impairment of the quality of the waters of the State by sewage or industrial waste to a degree which does not create an actual hazard to the public health but which does adversely and unreasonably affect such waters for domestic, industrial, agricultural, navigational, recreational, or other beneficial use." "'Nuisance' means damage to any community by odors or unsightliness resulting from unreasonable practices in the disposal of sewage or industrial wastes." The legislation also created a State Water Pollution Control Board and nine Regional Water Pollution Control Boards of which one, the Central Valley Regional Water Pollution Control Board, is responsible for the control of water pollution in the San Joaquin River Basin.

The Regional Board is empowered to establish, on a case by case basis, requirements governing the nature of the effects of a sewage or industrial waste discharge upon the receiving water or site, or that of the discharge itself, at the discretion of the Board. The Regional Board has sytematically devoted its efforts to the more serious problems in its three basins, and is concurrently securing the data needed to establish long-range plans and policies for each of its watersheds.

In May, 1952, the Regional Board published a statement of its general policy, recognizing five general water use patterns and setting forth the criteria for determining which of them characterizes any body of water or reach of a stream. 1/ This statement also includes the Board's intentions concerning the protection of ground water.

Ordinance No. 402 of the Fresno County Board of Supervisors, adopted February 11, 1950 (Appendix, following Table#3) regulates the disposal of industrial wastes and requires a permit from the County Health Officer to dispose of such wastes other than through a sewer system operated by a public agency.

1/ Central Valley Regional Water Pollution Control Board, "Policy Statement of the Central Valley Regional Water Pollution Control Board for the Control and Abatement of Water Pollution in the Central Valley", California State Printing Office, Sacramento, May 15, 1952.

POLLUTION PREVENTION MEASURES NEEDED

Wastes with a population equivalent of 172,600 are discharged in the San Joaquin River Basin from two municipal and 13 industrial disposal systems which are considered inadequate* (Table J), and wastes with a population equivalent of 404,000 are discharged from nine municipal and four industrial disposal systems of undetermined or unevaluated adequacy (Table K). Of this total load discharged by unsatisfactory and questionable systems, equivalent to the wastes from a population of 577,000, about 96 percent representing a population equivalent of 552,000 is discharged to watercourses.

Over one-quarter, in terms of BOD, of these wastes which reach watercourses are discharged by the inadequate disposal systems of two municipalities and ten industries, over one-third by two municipal and three industrial systems of undetermined adequacy, and over one-third by two municipal and one industrial systems whose adequacy has not been evaluated. The five largest of these 20 discharges constitute over three-quarters of the BOD load discharged to water by sources other than those considered adequate, and are itemized in Table L.

The Central Valley Regional Board's basic philosophy of concentrating on the existing cases of water pollution in order of their importance is a sound method of attacking the pollution problem and should insure the maximum return for the Board's efforts. The Board has been particularly active in striving for a solution of the disposal problem at Modesto, where the low stream flows are unable to assimilate the City's wastes even after the extensive treatment now provided.

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* "Adequacy", as used here, indicates discharges from those facilities classified as adequate have caused no complaints and appear, on the basis of preliminary investigations, to be satisfactory for present conditions. In most cases, however, no special surveys have been made or hearings held as required by California law to determine legally whether "pollution" or "nuisance" is existing or threatened.

TABLE J

SUMMARY OF SEWAGE AND INDUSTRIAL WASTE DISPOSAL
FROM INADEQUATE* TREATMENT OR COLLECTION SYSTEMS
IN THE SAN JOAQUIN RIVER BASIN

Disposal Made by	PE of Untreated Wastes			PE Discharged to		
	Domestic	Industrial	Total	Water	Land	Total
Municipalities	19,300	539,000	558,300	85,600	None	85,600
Industries	N.D.**	N.D.	N.D.	64,800***	22,200	87,000
TOTAL	N.D.	N.D.	N.D.	150,400	22,200	172,600

* "Adequacy", as used here, indicates discharges from those facilities classified as adequate have caused no complaints and appear, on the basis of preliminary investigations, to be satisfactory for present conditions. In most cases, however, no special surveys have been made or hearings held as required by California law to determine legally whether "pollution" or "nuisance" is existing or threatened.

** Not determined.

*** P.E. of wastes discharged to water by one industrial disposal system is unknown and is omitted from this figure.

TABLE K

SUMMARY OF SEWAGE AND INDUSTRIAL WASTE DISPOSAL
FROM TREATMENT OF COLLECTION SYSTEMS OF
UNDETERMINED OR UNEVALUATED ADEQUACY IN THE
SAN JOAQUIN RIVER BASIN

Disposal Made By	PE of Untreated Wastes			PE Discharged to		
	Domestic	Industrial	Total	Water	Land	Total
Municipalities	102,280	280,600	382,880	191,300	2,650	193,950
Industries	N.D.*	N.D.	N.D.	210,000	none	210,000
TOTAL	N.D.	N.D.	N.D.	401,300	2,650	403,950

* Not determined.

TABLE L

THE FIVE LARGEST DISCHARGES, WHICH ARE INADEQUATE OR WHOSE ADEQUACY IS UNDETERMINED OR NOT EVALUATED, CONTRIBUTING WASTES TO THE SURFACE WATERS OF THE SAN JOAQUIN RIVER BASIN

Source	Adequacy	P.E. Discharged	% of P.E. Discharged to Water by Sources Other than Those Considered Adequate
Stockton, South Plant	not evaluated	144,000	26.1
Fibreboard Co., Antioch	undetermined	110,500	20.0
Modesto	inadequate	84,000	15.2
Western California Canners, Inc., Antioch	undetermined	50,000	9.1
Avon Canning Co., Lodi	inadequate	35,000	6.3
TOTAL		423,500	76.7

APPENDIX

TABLE 1

BASIC DATA ON SOURCES OF MUNICIPAL* WASTE DISCHARGE

SAN JOAQUIN RIVER BASIN

Status on January 31, 1953

Name and Location	River Mile Above Mouth (est)	Population Served (est)	P.E.** of Wastes (est)	Waste Treatment	Adequacy *** of Treatment Facilities	P.E. ** Discharged (est)	Municipal Action
SAN JOAQUIN RIVER							
Big Creek Enters	323						
1. Wish-I-Ah (Fresno County TB Sanitarium	310	80	80	primary	undetermined	(L)1/ 50 2/	undetermined
Big Sandy Creek enters	275						
2. Friant	278	1,100	1,100	secondary	adequate	(L) 110 2/	none
3. Clovis	267	2,700	2,700	primary	adequate	(L) 1,800 2/	none
4. Camp Pinedale	265	850	850	primary	adequate	(L)undetermined	none
5. Fresno	265	94,000	529,000	primary	adequate	(L) 420,000	plant being enlarged.
6. Kerman	247	1,500	1,500	primary	adequate	(L) 1,200	new in 1951
Fresno Slough enters	219						
7. Fivebaugh	204	700	700	minor 3/	adequate	(L) 700	none

Name and Location	River Mile Above Mouth (est)	Population Served (est)	P.E.** of Wastes (est)	Waste Treatment	Adequacy *** of Treatment Facilities	P.E. ** Discharged (est)	Municipal Action
8. Dos Palos Sanitary District	186	1,000	1,600	primary	undetermined	(L)_ _ _ _ 1,000	none
Fresno River enters	183						
9. Los Banos	178	4,900	4,900	secondary	undetermined	(L)_ _ _ _ _ 400	none
Bear Creek enters	148						
10. Gustine	138	2,300	42,300	secondary	adequate	(L)_ _ _ _ 4,200 2/	none
11. Newman	132	1,500	1,500	primary	adequate	(L)_ _ _ _ 1,000	new in '52
Merced River enters	130						
12. Turlock	117	6,900	133,400	secondary	adequate	2,000	plant being enlarged.
13. Patterson	105	1,300	1,300	primary	adequate	(L)_ _ _ _ 1,000	planning
Tuolumne River enters	87						
Stanislaus River enters	77						
Old River leaves channel	53.5						
French Camp Slough enters	42						
Stockton	39						

14. North plant		40,000	40,000	primary	not evaluated	24,000	(study and ex-
15. South plant		37,000	287,000	secondary	not evaluated	144,000	(pansion under
							(way
Calaveras River enters	38						
16. Navy Supply Annex	34	2,500	2,500	primary	undetermined	300	none
14-Mile Slouth enters	34						
Old River re-enters channel	23.5						
Mokelumne River enters	22						
Dutch Slough enters	9						
17. Antioch	4.5	10,000	10,000	primary	adequate	7,000	new in 1953
OLD RIVER							
18. Tracy	23	8,500	8,800	secondary	adequate	1,300	none
BIG CREEK							
19. So.Cal.Edison Co. Adm. Center	6	400	400	secondary	adequate	40	new in 1951
BIG SANDY CREEK							
Little Sandy Creek enters							

Name and Location	River Mile Above Mouth (est)	Population Served (est)	P.E. ** of Wastes (est)	Waste Treatment	Adequacy *** of Treatment Facilities	P. E. ** Discharged (est)	Municipal Action
LITTLE SANDY CREEK							
20. New Auberry	4	160	160	primary	adequate	(L)_____100	new in 1952
FRESNO SLOUGH	219						
21. San Joaquin	22	240	240	primary	adequate	(L)_____200	none
22. Tranquillity	18	500	500	primary	undetermined	(L)_____300	plant out of operation
23. Mendota	4	1,300	1,300	primary	undetermined	(L)_____900	none
FRESNO RIVER	183						
24. Madera	37	12,000	40,000	secondary	adequate	(L)____4,000	expanded in 1950
Dry Creek enters							
Ash Slough enters	5						
25. San Joaquin Weather Station USAF		200	200	primary	adequate	(L)_____100	none
ASH SLOUGH							
26. Chowchilla	19	1,900	2,500	intermediate	adequate	(L)_____600	expanded in 1950
BEAR CREEK							
27. Merced	25.4	15,100	19,200	primary	adequate	(L)undetermined2/	new plant in 1951

Black Rascal Slough enters							
BLACK RASCAL SLOUGH							
Canal Creek enters							
28. Castle Field US Air Force Base		5,000	5,000	secondary	adequate	(L)____1,000	none
29. Atwater	19	1,500	37,500	primary	adequate	(L)____26,000	expanded in 1949
MERCED RIVER							
30. Yosemite National Park	106	20,000	20,000	secondary	adequate	2,000	none
31. Livingston	20	1,500	1,500	primary	adequate	150	none
TUOLUMNE RIVER							
Turnback Creek enters	84						
Moccasin Creek enters	74						
Woods Creek enters	71						
32. Hughson Sanitary District	23	1,800	1,800	primary	adequate	(L)____1,500	new plant in 1948
33. Empire Sanitary District	19	1,800	1,800	primary	adequate	(L)____1,500	new plant in 1949
34. Ceres Sanitary District	15	2,300	2,300	secondary	adequate	(L)_____230	none

Name and Location	River Mile Above Mouth (est)	Population Served (est)	P. E. ** of Wastes (est)	Waste Treatment	Adequacy *** of Treatment Facilities	P. E. ** Discharged (est)	Municipal Action
35. Modesto 3/	13	17,000	556,000 4/	secondary	inadequate	84,000	studies underway
36. Modesto State Hospital		3,200	3,200	secondary	adequate	(L)_____750	none
TURNBACK CREEK							
37. Tuolumne City Sanitary District	8	1,500	1,500	secondary	adequate	800	new plant in 1951
MOCCASIN CREEK							
38. Moccasin (City of S.F. Dept. of Elec. Powerhouse & Camp	3	300	300	septic tank	adequate	(L)_____200	none
WOODS CREEK	71						
39. Sonora	13.5	2,300	2,300	primary	inadequate	1,600	none
40. Jamestown Sanitary District	10	950	950	secondary	adequate	300	new plant in 1951
Sullivan Creek enters	5						
SULLIVAN CREEK							
Curtis Creek enters	2						
CURTIS CREEK							
41. Standard	7	400	400	septic tank and percolation beds	adequate	(L)_____300	none

STANISLAUS RIVER								
Mormon Creek enters	69							
42. Oakdale	43	4,000	7,800	intermediate	adequate	(L)_ _ _ _	2,300	new plant in 1949
43. Riverbank	35	2,700	2,700	primary	adequate	(L)_ _ _ _	1,750	new plant in 1949
44. Escalon Sanitary District	30	1,100	1,100	primary	adequate	(L)_ _ _ _ _	800	new plant in 1949
45. Ripon Sanitary District	30	1,800	1,800	primary	adequate	(L)_ _ _ _	1,200	new plant in 1949
MORMON CREEK								
46. Columbia State Park	11	5,000	5,000	secondary	adequate		1,500	new plant
FRENCH CAMP SLOUGH								
Lone Tree Creek enters	7							
LONE TREE CREEK								
47. Manteca	0	3,800	7,300	secondary	adequate	(L)_ _ _ _	1,000 2/	none
48. Sharpe Signal Depot U.S. Army	0	1,900	1,900	secondary	adequate		200	none
49. Stockton Airfield	0	500	500	primary	adequate		275	none
14-MILE SLOUGH								

Name and Location	River Mile Above Mouth (est)	Population Served (est)	P. E. ** of Wastes (est)	Waste Treatment	Adequacy *** of Treatment Facilities	P. E. ** Discharged (est)	Municipal Action
50. Lincoln Village Pacific Gardens		4,500	4,500	secondary	adequate	1,000	none
51. Colonial Heights		undetermined	undetermined	primary	adequate	undetermined	none
52. Stockton State Hospital		undetermined	undetermined	secondary	adequate	undetermined	none
MOKELUMNE RIVER							
53. Mokelumne Hill	80	600	600	primary	adequate	(L)_ _ _ _ _ 400 2/	new plant in 1948
54. Lodi	38	15,000	45,000	secondary	undetermined	23,000	planning
55. Woodbridge	36	1,500	1,500	primary	adequate	(L)_ _ _ _1,000	new plant in 1950
Dry Creek enters	27						
Cosumnes River	23.5						
DRY CREEK							
Sutter Creek enters	33						
Jackson Creek enters	25						
56. Galt Sanitary District	12	1,800	3,200	primary	adequate	(L)_ _ _ _ _ 400	none
SUTTER CREEK							

57. Sutter Creek	14	1,100	1,100	primary	adequate		700	new plant in 1950
58. Preston School for Boys	4	850	850	secondary	adequate		300	none
JACKSON CREEK								
59. Jackson	17	2,000	2,000	primary	adequate		1,300	none
DUTCH SLOUGH								
Marsh Creek enters	3							
MARSH CREEK								
60. Brentwood	9	1,500	1,500	secondary	adequate	(L)_____	150	none
61. Oakley Sanitary District	1.5	1,000	1,000	primary	adequate	(L)_____	700	new plant in 1946

* Sewer systems which handle domestic sewage.

** Includes industrial wastes received by municipal sewers. The population equivalent (P. E.) of organic wastes susceptible to biological treatment is estimated on the basis that one person produces 0.167 pounds of five-day, 20°C BOD daily.

*** "Adequacy", as used here, indicates discharges from those facilities classified as adequate have caused no complaints and appear, on the basis of preliminary investigations, to be satisfactory for present conditions. In most cases, however, no special surveys have been made or hearings held as required by California law to determine legally whether "pollution" or "nuisance" is existing or threatened.

1/ Symbol (L) means discharge to percolation beds, oxidation lagoons, irrigated fields, or other land area.

2/ Occasionally overflows to stream or irrigation ditch.

3/ Screening only.

4/ Industrial wastes, equivalent to 539,000 population, are treated in a municipal industrial waste treatment plant. The effluent is combined with that from the sewage treatment plant, aerated, and ponded in oxidation lagoons.

TABLE 2
BASIC DATA ON SOURCES OF INDUSTRIAL* WASTE DISCHARGE
SAN JOAQUIN RIVER BASIN
Status on January 31, 1953

Name and Location	River Mile Above Mouth (est)	Type of Industry	Type of Waste	Waste Treatment	Adequacy *** of Treatment Facilities	P. E. ** Discharged		Industrial Action
SAN JOAQUIN RIVER								
1. Italian Swiss Colony Clovis	x 1/	wine	organic	oxidation ponds	adequate	(L) 2/	400,000	Inactive
2. Crestview Winery, Inc., Fresno	x	"	"	screening	adequate	(L)	81,000	"
3. B. Cribari & Sons Fresno	x	"	"	percolation beds	adequate	(L)	240,000	"
4. Enoch Packing Co. Del Rey		food	"	oxidation ponds	adequate	(L)	1,700	"
5. Alta Vineyard Co., Fresno	x	wine	"	percolation beds	adequate	(L)	240,000	"
6. Raisin Syrup Co. Fowler		food	"	oxidation ponds	adequate	(L)	900	"
7. Del Rey Coop. Winery Assn., Fresno	x	wine	"	percolation beds	adequate	(L)	8,000	"
8. Fresno Winery Inc. Fresno	x	"	"	" "	adequate	(L)	41,000	"
9. Fresno Meat Packing Co., Fresno	x	food	"	percolation beds	adequate	(L)	109,000	"

10. San Joaquin Winery & Dist., Inc., Fresno	x	wine	organic	percolation beds	adequate	(L)	22,000	inactive
11. Kearney Coop. Winery Assn., Fresno	x	"	"	"	"	(L)	41,400	"
12. Bonner Packing Co., Fresno	x	food	"	"	"	(L)	4,800	"
13. Cella Vineyards, Fresno	X	wine	"	"	"	(L)	72,000	"
14. Florio Bros. Olive Oil Co., Fresno	x	food	"	cesspools	"	(L)	1,000	"
15. Fresno Coop. Raisin Growers, Inc., Fresno	x	"	"	percolation beds	"	(L)	500	"
16. Henrietta Rancho Prod. Co., Fresno	x	"	"	"	"	(L)	900	"
17. Vie-Del Grape Prod. Co., Fresno	x	"	"	"	"	(L)	28,000	"
18. Oil Seed Products Co., Calwa	x	"	"	"	"	(L)	96,000	"
19. Biola Packing Co., Biola	x	"	"	"	"	(L)	330	"
20. Diebert Packing Co. Biola	x	"	"	"	"	(L)	2,700	"
21. Morello Winery Kerman	x	wine	"	"	"	(L)	130,000 3/	"

Name and Location	River Mile Above Mouth (est)	Type of Industry	Type of Waste	Waste Treatment	Adequacy *** of Treatment Facilities	P. E. ** Discharged	Industrial Action
22. Gustine Creamery, Dos Palos	x	food	organic	percolation beds	adequate	(L) 600	Inactive
23. Dos Palos Winery, Dos Palos	X	wine	"	"	"	(L) 14,000	"
Fresno River enters	182						
Bear Creek enters	148						
24. Newman Tallow Works Newman	x	food	"	"	"	(L) undetermined	"
25. Pacific Tallow Works Turlock	x	"	"	"	"	(L) undetermined	"
Tuolumne River enters							
Stanislaus River enters							
Old River (leaves channel)	53.5						
French Camp Slough enters	42						
Calaveras River enters	37						
Old River (re-enters channel)	23.5						

Mokelumne River enters	22						
Dutch Slough enters	9						
26. Fibreboard Co., San Joaquin Division, Antioch	6	pulp & paper	organic	none	adequate	200,000	Inactive
27. Fibreboard Co., Antioch	4.5	" " "	"	"	undetermined	110,500	"
28. Hickmott Canning Co., Antioch	4.5	food	"	"	undetermined	20,000	"
29. Western California Canners Inc., Antioch	4.5	"	"	"	"	50,000	"
OLD RIVER							
30. Holly Sugar Beet Co. Tracy	23	"	"	oxidation ponds	adequate	200	"
31. Tracy Industrial Waste Disposal System	23	"	"	oxidation ponds	not evaluated	29,500	"
FRESNO RIVER							
Ash Slough enters	5						
ASH SLOUGH							
32. Danish Creamery Assn. Chowchilla	x	"	"	" "	adequate (L)	1,500	"

Name and Location	River Mile Above Mouth (est)	Type of Industry	Type of Waste	Waste Treatment	Adequacy*** of Treatment Facilities	P. E. ** Discharged		Industrial Action
33. Yosemite Creek Co., Merced	x	food	organic	percolation beds	inadequate	(L)	3,100	Inactive
34. Yosemite Growers Coop., Merced	x	"	"	"	"	(L)	3,100	"
Black Rascal Slough leaves channel)	22.5							
Black Rascal Slough (re-enters channel)	17.4							
BLACK RASCAL SLOUGH								
Canal Creek enters	6							
CANAL CREEK								
35. Davis Canning Co., Atwater	x	"	"	"	adequate	(L)	50,000	"
TUOLUMNE RIVER								
Woods Creek enters	71							
36. Waterford Winery, Waterford		wine	"	"	"	(L)	33,600	"
37. Modesto Coop. Winery, Empire	x	"	"	"	"	(L)	43,000	"
38. Gallo Winery, Modesto		"	"	"	"	(L)	76,500	"

39. Beard Ind. Waste Disposal System Modesto	13	food	organic	percolation beds	adequate	(L)	21,000	inactive
40. Anker Meat Co., Modesto	13	"	"	screening	inadequate		5,700	active planning
41. Arnopole Meat Co., Modesto	13	"	"	none	"		11,000	" "
42. Zeff Meat Co., Modesto	13	"	"	"	"		1,050	" "
43. Modesto Tallow Co., Modesto	13	rendering	"	screening & sedimentation	"		6,000	" "
44. Horsemeat Packing Co., Modesto	13	food	"	none	"		150	" "
45. Paso Del Oro Grape Dehyd. Plant, Modesto	13	"	"	screening	"		3,500	" "
WOODS CREEK								
46. U.S. Lime Prod. Co. Sonora	13.5	dolomite & lime mining	inorganic	settling ponds	adequate	silt only		inactive
STANISLAUS RIVER								
47. Port Stockton Sausage Co., Ripon	42	food	organic	oxidation ponds	adequate	(L)	undetermined	"
48. Hunt Foods, Inc., Oakdale	43	"	"	screening & oxidation ponds	"	(L)	12,000 3/	"

Name and Location	River Mile Above Mouth (est)	Type of Industry	Type of Waste	Waste Treatment	Adequacy *** of Treatment Facilities	P. E. ** Discharged	Industrial Action
49. Riverbank Ordnance Plant, Riverbank	37	metal working	inorganic	cyanide destruction, neutralization, & percolation ponds	adequate	not available	inactive
50. Riverbank Muni. Industrial Treatment Plant	35	(6 food processors)	organic	oxidation ponds	"	(L) 60,000 3/	"
51. Escalon Muni. Ind. Treatment Plant	30	(4 food processors)	"	" "	"	(L) 45,000	"
52. Turlock Cooperative Growers, Escalon	20	food	"	screens & oxidation ponds	"	(L) 35,000	"
53. Vella Brothers Winery, Escalon	17	wine	"	oxidation ponds	"	(L) undetermined	"
54. Ripon Muni. Ind. Treatment Plant	16	(4 food processors)	"	" "	"	(L) 60,000	"
55. Pironne Winery, Escalon	14	wine	"	" "	"	(L) undetermined	"
FRENCH CAMP SLOUGH							
Lone Tree Creek enters	7						
LONE TREE CREEK							
56. Petri Winery Escalon		wine	"	oxidation ponds	adequate	(L) undetermined	inactive

57. Franzia Wine Co. Manteca		wine	organic	oxidation ponds	adequate	(L) undetermined	Inactive
58. Spreckles Sugar Co., Manteca	5	food	"	"	"	(L) 322,000	"
59. Manteca Ind. Wastes Disposal System	5	(2 food processors)	"	"	inadequate	(L) 16,000	ponds new in 1951. Active planning
60. Stockton Tallow Works, Manteca	5	food	organic	primary	inadequate	2,400	Inactive
CALAVERAS RIVER							
Bear Creek enters							
61. Calaveras Cement Co. San Andreas	50	cement mfg.	inorganic	settling ponds	adequate	none	"
BEAR CREEK							
62. Aron Canning Co., Lodi		food	organic	oxidation ponds	inadequate	35,000	"
63. Alpine Packing Co. Lodi		"	"	percolation beds	adequate	(L) undetermined	"
MOKELUMNE RIVER							
64. Penn Mine, Campo Seco	68	mining	inorganic	copper removal settling ponds	"	none	Inactive
65. Lockeford Winery Lockeford	48	wine	organic	oxidation ponds	"	(L) 52,000	"
66. Victor Winery, Lodi	38	"	"	"	"	(L) 5,200	"
67. Roma Winery		"	"	percolation beds	adequate	(L) undetermined	"

Name and Location	River Mile Above Mouth (est)	Type of Industry	Type of Waste	Waste Treatment	Adequacy *** of Treatment Facilities	P. E. ** Discharged	Industrial Action
68. Guild Wine Co., Lodi (bottling plant)		wine	organic	none	adequate	undetermined	inactive
69. East Side Winery, Lodi	38	"	"	oxidation ponds	"	(L) 28,600	"
70. Lodi Winery, Lodi	38	"	"	" "	"	(L) 12,000	"
71. Lodi Grape Products Assn., Lodi		food	"	" "	"	(L)undetermined	"
72. Community Grape Corp., Lodi	38	"	"	" "	"	(L) 45,000	"
73. Bear Creek Vineyard Assn., Lodi	38	wine	"	" "	"	(L) 36,800	"
74. Cherokee Vineyard Assn., Acampo	38	"	"	" "	"	(L) 48,500	"
75. Liberty Winery Inc. Acampo	37	"	"	" "	"	(L) 20,200	"
76. Sebastiani Winery Woolbridge	37	"	"	" "	"	(L)undetermined	"
77. Mokelumne Winery Inc., Woodbridge	36	"	"	" "	"	(L) 5,500	"
78. Del Rio Winery Woodbridge	36	"	"	" "	"	(L) 41,500	"
79. Acampo Winery & Dist., Acampo	36	"	"	" "	"	(L) 21,600	"

80. Thornton Canning Co., Thornton	food	organic	oxidation ponds	adequate	35,000	Inactive
COSUMNES RIVER						
Sutter Creek enters						
SUTTER CREEK						
81. Central Eureka Mining Co., Sutter Creek	mining	inorganic	settling ponds	adequate	none	"
Sly Park Creek enters						
SLY PARK CREEK						
82. Hazel Creek Mining Co., Sutter Creek	mining	inorganic	none	inadequate	none	"
DUTCH SLOUGH						
Marsh Creek enters						
MARSH CREEK						
83. Mt. Diablo Mine	mercury mining	"	settling pond & oxidation	inadequate	not available	requirements set by Reg. Board

* Sewer systems primarily handling industrial wastes. Those handling significant quantities of human sewage mixed with industrial wastes appear on Table 1, "Basic Data on Sources of Municipal* Waste Discharge."

** The population equivalent (P. E.) of organic wastes susceptible to biological treatment is estimated on the basis that one person produces 0.167 pounds of five-day, 20° C BOD daily.

*** "Adequacy", as used here, indicates discharges from those facilities classified as adequate have caused no complaints and appear, on the basis of preliminary investigations, to be satisfactory for present conditions. In most cases, however, no special surveys have been made or hearings held as required by California law to determine legally whether "pollution" or "nuisance" is existing or threatened.

1/ The symbol "x" indicates that the discharge is not on or near a stream. "River mile" is inapplicable.

2/ Symbol "(L)" means discharge to percolation beds, oxidation lagoons, irrigated fields, or other land area.

3/ Occasionally overflows to stream or irrigation ditch.

TABLE 3

MUNICIPAL WATER SUPPLIES IN THE SAN JOAQUIN RIVER BASIN

Community	County	Source of Supply	Treatment	Population	Population Served *	Consumption M.G.D.
Amador	Amador	No. Fork Mokelumne River	chlorination	200	200	0.07 to 0.08
Angels Camp	Calaveras	No. Fork Stanislaus River	chlorination	1,146	1,460	0.15 to 0.67
Antioch	Contra Costa	San Joaquin River	alum, coagulation, pri. clarification, lime, activated carbon, secondary clarification, filtration, chlorination	10,983	11,000	0.75 to 2.1
Atwater	Merced	3 deep wells	none	2,872	2,800	0.28 to 1.5
Brentwood	Contra Costa	2 deep wells	none	1,500	1,500	0.026 to 0.07
Calwa	Fresno	3 deep wells	none	3,000E	2,900	0.082 to 0.29
Ceres	Stanislaus	3 deep wells	none	2,300	2,100	0.19 to 0.95
Chowchilla	Madera	4 deep wells	none	3,883	3,250	0.6 to 1.74
Clovis	Fresno	4 deep wells	none	2,757	2,420	0.40 to 0.85
Dos Palos	Merced	San Joaquin River	coagulation, settling, filtration, chlorination	1,000	1,000	0.06 to 0.55
El Portal	Mariposa	Crane Creek and Merced River	none	260	260	
Empire	Stanislaus	deep well	none	1,800	1,250	

Escalon	San Joaquin	3 deep wells	none	1,800	1,500	0.08 to 0.238
Firebaugh	Fresno	deep well and San Joaquin River	chlorination	700	700	0.1 to 0.2
Fresno	Fresno	45 deep wells	none	90,618	125,000	12.0 to 83.0 Est.
Fresno County Water Dist. #1	Fresno	3 deep wells	none	3,000	3,000	0.18 to 1.87
Fresno County Water Dist. #2	Fresno	deep well	none	750	750	0.039 to 0.49 Est.
Fresno County Water Dist. #3	Fresno	deep well	none	1,000	1,000	-
Fresno County Water Dist. #4	Fresno	4 deep wells	none	5,000	4,200	0.2 to 2.0
Galt	Sacramento	2 deep wells	none	2,000	2,000	0.25 to 1.00
Gustine	Merced	3 deep wells	none	2,300	2,000	0.34 to 0.54
Highway City	Fresno	3 deep wells	none	1,100	1,100	-
Ione	Amador	No. Fork Mokelumne River	chlorination	1,500	1,500	0.26 to 0.79
Jackson	Amador	No. Fork Mokelumne River	alum coagulation, chlorination	1,867	1,800	0.15 to 0.32
Jamestown	Tuolumne	So. Fork Stanislaus River	alum coagulation chlorination	1,000	1,000	0.086 to 0.183
Kerman	Fresno	2 deep wells	none	1,500	1,500	0.025 ave. to 0.06 max.
Livingston	Merced	2 deep wells	none	1,500	1,500	0.20 to 0.40

Community	County	Source of Supply	Treatment	Population	Population Served *	Consumption M.G.D.
Lockeford	San Joaquin	2 deep wells	none	700	700	0.04 to 0.24
Lodi	San Joaquin	8 deep wells	none	13,727	13,000	3.0 to 11.6
Los Banos	Merced	San Joaquin River	coagulation, settling, filtration, chlorination, calgon & lime treatment	3,882	3,000	0.54 to 1.25
Madera	Madera	10 deep wells	none	10,428	12,600	0.15 to 6.5
Manteca	San Joaquin	3 deep wells	none	3,807	3,700	0.39 to 1.36
Mariposa (Trabucco Supply)	Mariposa	spring	none	240	240	-
Mariposa P.U.D.	Mariposa	Stockton Creek	chlorination	200	200	-
Mendota	Fresno	2 deep wells	none	1,537	700	-
Merced	Merced	8 deep wells	none	15,144	14,000	2.5 to 8.3
Modesto	Stanislaus	18 deep wells	none	17,347	17,500	2.7 to 10.5
Modesto Fringe Area						
East Modesto	Stanislaus	deep wells	none	11,200	11,200	-
North Modesto	Stanislaus	deep wells	none	1,700	1,700	-
West Modesto	Stanislaus	deep wells	none	4,300	4,300	-
Newman	Stanislaus	2 deep wells	none	1,800	1.800	0.22 to 0.60
Oakdale	Stanislaus	2 deep wells	none	4,060	5,300	0.33 min.
Patterson	Stanislaus	3 deep wells	none	2,100	2,100	0.13 to 0.27

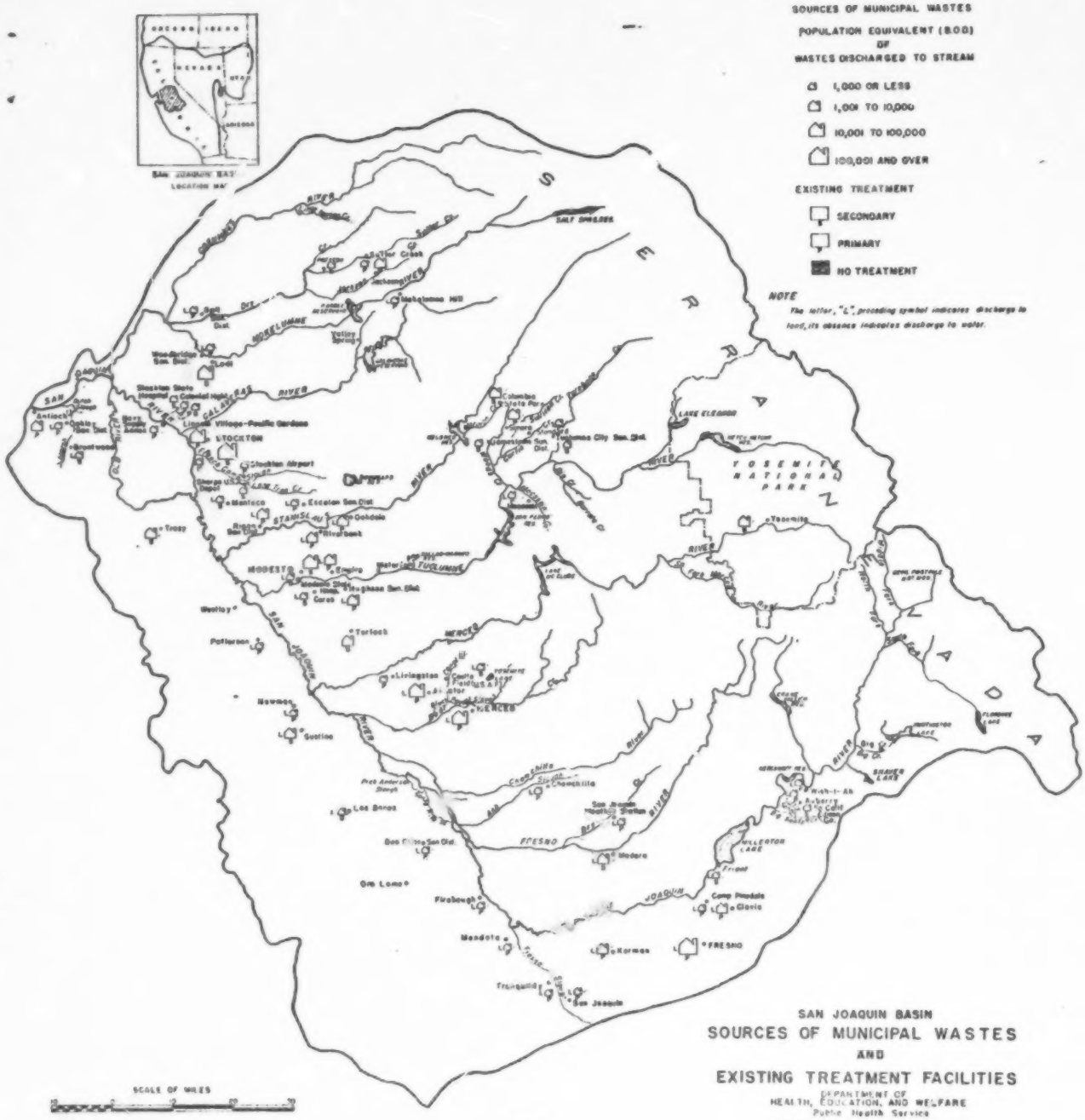
Plymouth	Amador	So. & Middle Forks Cosumnes River	chlorination	500	500	0.02 to 0.04
Ripon	San Joaquin	2 deep wells	none	1,100	1,100	0.4 to 0.7
Riverbank	Stanislaus	3 deep wells	none	3,200	4,200	0.28 to 1.4
Salida	Stanislaus	deep well	none	1,200	1,200	-
San Andreas **	Calaveras	So. & Middle Forks, Mokelumne River	chlorination	1,900	1,900**	
San Joaquin	Fresno	deep well	none	600	560	0.006 to 0.01
Sonora	Tuolumne	So. Fork, Stanislaus River	aeration, coagulation, settling, chlorination	2,437	3,000	0.35 to 0.90
Stockton	San Joaquin	36 deep wells	none	71,660	100,000	6.9 to 21.7
Sutter Creek	Amador	No. Fork, Mokelumne River	chlorination	1,137	1,100	0.4 to 0.41
Tranquility	Fresno	deep well	none	500	500	0.006 to 0.01
Tracy	San Joaquin	6 deep wells	none	8,455	9,000	0.43 to 1.0
Turlock	Stanislaus	9 deep wells	none	6,221	6,500	1.3 to 5.0
Valley Springs	Calaveras	deep well	none	350	350	-
Waterford	Stanislaus	deep well	none	1,700	1,700	-
Wawona (resort)	Mariposa	So. Fork Merced River	chlorination	300	300	-
San Francisco and Peninsula Communities	San Francisco San Mateo Santa Clara	Tuolumne River ***	chlorination	-	920,000E	-

Community	County	Source of Supply	Treatment	Population	Population Served *	Consumption M.G.D.
East Bay Municipal Utility District	Alameda Contra Costa	Mokelumne River ***	aeration, coagulation, settling, filtration, disinfection	-	790,000E	-

* Municipal water supplies often provide service to fringe areas of relatively large populations which are not inside the incorporated city limits.

** San Andreas provides the water supply for Mokelumne Hill. Mokelumne Hill's population, population served, and consumption are included in the San Andreas tabulation.

*** These are the sources used by these communities from the San Joaquin River Basin. In addition local impounded supplies outside of this Basin are used both by San Francisco and the East Bay Cities.



SAN JOAQUIN BASIN

SOURCES OF MUNICIPAL WASTES AND EXISTING TREATMENT FACILITIES

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
Map No 4

PHS 999-WP-25

25-A

ORDINANCE NO. 402

AN ORDINANCE REGULATING THE DISPOSAL OF INDUSTRIAL WASTE AND REQUIRING A PERMIT THEREFOR.

The Board of Supervisors of the County of Fresno do ordain as follows:—

SECTION NO. 1--DEFINITIONS:--The following terms when used in this ordinance shall have the meaning ascribed to them in this section.

(a)—"Person" shall include any individual, firm, copartnership, joint adventure, association, and corporation and whether as owner, lessee, agent or employee of another.

(b)--"Health Officer" shall mean the Health Officer of the County of Fresno, his deputies and assistants.

(c)--"Industrial Plant" shall include but not be limited to wineries, distilleries, slaughter houses, reduction works, oil refineries, seed oil processing plants, dried fruit or other food processing, canning or packing plants, manufacturing plants, and plants of a similar nature.

(d)—"Industrial Waste" shall include sewage, feculent matter, offal, winery slops, stillage, lees, distillery water, oils, or any fluid or semifluid containing any chemical or other solids, whether of vegetable, animal, or mineral origin, and which has been produced or formed as a result of or incidental to the operation of any industrial plant.

(e)—"Dispose" shall mean to dispose of in any manner or treat by any process, store, hold, or establish or maintain any method or system of disposal, treating processing, or holding industrial waste.

SECTION NO. 2:--It shall be unlawful for any person to dispose of any industrial waste other than through a sewer system operated by a public agency or other than in strict conformity with the terms of a permit therefor previously issued by the Health Officer.

SECTION NO. 3:--Upon application made to the Health Officer upon the form prescribed by him for a permit to dispose of industrial waste, the Health Officer shall make a full investigation of the proposal, and if he finds that the proposed method of disposing of such industrial waste is such that there will not be maintained or created a hazard to public health or a public nuisance, he shall issue a permit therefor and may as terms thereof impose such conditions and restrictions as in his opinion may be reasonably necessary to prevent the maintenance or creation of a hazard to public health or a public nuisance and may from time to time modify such conditions and restrictions as the public health and welfare may require.

SECTION NO. 4:--Violation of this ordinance shall constitute a misdemeanor punishable by fine not to exceed five hundred ($500.00) dollars or by confinement not to exceed six months in such county

detention facility as may be established and in the manner prescribed by law. Each and every day such violation continues shall be deemed a separate offense hereunder. Provided further, that this ordinance may be enforced by appropriate injunctive proceedings.

SECTION NO. 5:--Ordinance No. 361, as amended by Ordinance No. 381, is hereby repealed. Provided, however, that any existing license issued thereunder shall remain in full force and effect until the expiration thereof in the same manner and under the same conditions as though it were a permit issued hereunder.

(Adopted February 7, 1950)

TABLE 4

ESTIMATED CASH FARM INCOME BY COUNTIES IN SAN JOAQUIN RIVER BASIN
(Data from Report No. 23, Economic Survey Series 1950-1951,
California State Chamber of Commerce)

Counties Lying Wholly Within Basin

Name	Income 1940	Income 1949	% Area in Basin	% Change from 1940
Madera	9,400,000	41,906,000	100	345.8
Merced	20,300,000	64,656,000	100	218.5
San Joaquin	39,000,000	103,968,000	100	166.6
Stanislaus	25,700,000	80,321,000	100	212.5
Calaveras	*	*	100	*
Mariposa	*	*	100	*
Tuolumne	*	*	100	*

Counties of Which a Part Lies Within the Basin

Name	Income 1	Income 1949	% Area in Basin	% Change from 1940
Alameda	11,600,000	25,044,000	10	115.9
Contra Costa	8,000,000	14,368,000	39	79.6
San Benito	5,800,000	15,166,000	25	161.5
Sacramento	15,700,000	40,909,000	50	160.6
El Dorado	1,800,000	3,632,000	29	101.8
Fresno	39,200,000	172,614,000	44	340.3
Alpine	*	*	32	*
Amador	*	*	98	*

* Separate totals for these counties not given - included only in total for other counties.

TABLE 5

TRUCK CROP PRODUCTION FOR COUNTIES IN SAN JOAQUIN RIVER BASIN - 1950
(Data from "Vegetable Crops in California", May 1951,
California Crop and Livestock Reporting Service, Sacramento, California)

County	Acreage in Truck Crops	Dollar Value 1950	% of County Area in Basin
	Counties Lying Wholly Within Basin		
Calaveras	*	*	100
Madera	2,180	969,705	100
Mariposa	*	*	100
Merced	10,178	5,166,270	100
San Joaquin	101,467	37,080,030	100
Stanislaus	24,332	8,421,465	100
Tuolumne	*	*	100
	Counties of Which a Part Lies Within the Basin		
Alameda	11,592	5,623,560	10
Alpine	*	*	32
Amador	38	11,340	98
Contra Costa	13,109	4,812,045	39
El Dorado	*	*	29
Fresno	24,385	10,701,965	44
Sacramento	12,753	5,084,045	50
San Benito	7,961	3,113,835	25

*Counties with small truck crop production - no production totals given in source of information.

TABLE 6

MILK AND MILK PRODUCTS OF COUNTIES IN SAN JOAQUIN RIVER BASIN
(From special publication No. 234, California Crop & Lifestock Registry Service)

County	Commercial Dairy Farms 1946	Production of Commercial Milk 1948 (In thousands of pounds)	Specified Dairy Products Manufactured - 1948					
			Butter 1,000 lbs.	Cheese 1,000 lbs.	Uncreamed Cottage Cheese 1,000 lbs.	Ice Cream 1,000 gal.	Ice Milk 1,000 gal.	% Area in Basin
Counties Lying Wholly Within the Basin								
Calaveras	15	30	-	-	-	*	*	100
Madera	545	3,106	-	-	*	16	9	100
Mariposa	3	6	-	-	-	-	-	100
Merced	2,532	17,091	*	*	*	38	12	100
San Joaquin	1,639	11,134	*	-	*	508	198	100
Stanislaus	3,683	20,683	2,617	-	*	215	104	100
Tuolumne	6	56	-	-	-	17	9	100
Counties of Which a Part Lies Within the Basin								
Alameda	132	2,392	-	681	338	5,016	1,085	10
Alpine	5	1	-	-	-	-	-	32
Amador	31	133	-	-	-	-	-	98
Contra Costa	72	504	-	-	-	153	30	39
El Dorado	45	91	-	-	-	*	*	29
Fresno	1,844	8,499	*	-	4,697	862	267	44
Sacramento	947	4,495	*	-	3,468	1,509	522	50
San Benito	91	334	-	-	-	*	*	25
State of California**	25,033	213,608	26,264	6,686	43,844	39,929	9,044	-

* Totals not given because less than three firms in counties manufacturing products.
** Added to Table for comparison.

TABLE 7

MANUFACTURING IN COUNTIES IN SAN JOAQUIN RIVER BASIN 1939-1947
(Report No. 29, Economic Survey Series 1949-50,
California State Chamber of Commerce)

County	Number of Establishments		Number of Employees: Production Workers				Wages and Salaries-1947 (In thousands of dollars)	Value Added by Manufacturers-1947 (In thousands of dollars)	% Area in Basin
	1939	1947	1939	1947	% Change	All Employees 1947			
Counties Lying Wholly Within the Basin									
Madera	20	42	178	585	228.7	700	2,177	8,779	100
Merced	49	48	1,096	1,028	-6.2	1,177	3,080	6,739	100
San Joaquin	196	234	4,329	8,082	86.7	9,672	28,900	63,949	100
Stanislaus	103	147	2,707	4,605	70.1	5,278	14,385	31,727	100
Calaveras**									100
Tuolumne**									100
Mariposa**									100
Counties of Which a Part Lies Within the Basin									
Alameda	893	1,186	26,846	54,038	101.3	66,322	209,321	409,206	10
Amador**									98
Alpine*									32
Contra Costa	115	168	13,316	20,089	50.9	24,316	79,546	155,142	39
El Dorado	16	48	966	1,416	46.6	1,524	5,044	8,493	29
Fresno	244	307	4,888	6,134	25.5	7,519	21,999	57,268	44
Sacramento	206	247	4,997	6,765	35.4	8,320	24,762	52,512	50
San Benito	10	11	115	291	153.0	322	903	1,664	25
State of California***	11,558	17,648	271,290	530,283	95.5	663,872	2,064,523	3,994,981	

* Figures withheld to avoid disclosing figures for individual companies.
** No figures by County given - included only in area totals.
*** Added to Table for comparison.

TABLE 8

COMMODITY PRODUCTION OF FOREST PRODUCTS OF COUNTIES IN SAN JOAQUIN RIVER BASIN - 1948

(Data from "Analysis of the Production of California Timber" - 1948, Dec. 15, 1949, California Division of Forestry)

County	Number Registrants (1949)	Saw Logs & Veneer Logs (1000 board ft.)	Fence Posts (Pieces)	Other Split Products (1000 board ft.)	Fuel Wood (cords)	Trees	% County Area in Basin
Counties Lying Wholly Within the Basin							
Calaveras	31	155,884	-	-	-	109	100
Madera	9	18,628	-	-	-	-	100
Mariposa	16	22,386	-	-	-	-	100
Merced	-	-	-	-	-	-	100
San Joaquin	-	-	-	-	-	-	100
Stanislaus	-	-	-	-	-	-	100
Tuolumne	24	164,840	-	-	-	142	100
Counties of Which a Part Lies Within the Basin							
Alameda	-	-	-	-	-	-	10
Alpine	3	495	-	-	-	-	32
Amador	7	14,826	-	-	-	170	98
Contra Costa	-	-	-	-	-	-	39
El Dorado	65	243,794	1,200	30	200	6,550	29
Fresno	10	40,755	-	-	-	-	44
Sacramento	-	-	-	-	-	-	50
San Benito	-	-	-	-	-	-	25
Totals		661,850	1,200	30	200	6,971	
State of California*	813	3,975,573	10,740	3,655	1,275	109,056	-

* Added to Table for comparison.

TABLE 9

PRODUCTION OF LUMBER BY COUNTIES AND SPECIES IN 1946 IN THOUSANDS OF FEET-BOARD MEASURE
(Source of Data, California Forest and Range Experiment Station, U.S. Forest Service)

County	Number of Active Mills	Ponderosa Pine (MBM)	Douglas Fir (MBM)	White Fir (MBM)	Sugar Pine (MBM)	Redwood (MBM)	Total (MBM)	% of County Area in Basin
Counties Lying Wholly Within the Basin								
Calaveras	41	55,066	11,204	24,596	17,067	-	111,203	100
Madera	20	13,746	-	4,756	3,311	-	21,991	100
Mariposa	34	17,257	-	525	2,488	-	20,675	100
Merced	-	-	-	-	-	-	-	100
San Joaquin	-	-	-	-	-	-	-	100
Stanislaus	-	-	-	-	-	-	-	100
Tuolumne	34	48,733	1,511	19,507	29,741	-	102,619	100
Counties of Which a Part Lies Within the Basin								
Alameda	-	-	-	-	-	-	-	10
Alpine 1/	2	7,702	-	5,776	-	-	13,496	32
Amador 2/	16	33,919	3,543	14,532	11,166	-	74,995	98
Contra Costa	-	-	-	-	-	-	-	39
El Dorado	-	-	-	-	-	-	-	29
Fresno	21	14,465	-	11,171	9,808	80	37,664	44
Sacramento 2/	2/	2/	2/	2/	2/	-	2/	50
San Benito	-	-	-	-	-	-	-	25
State of California 3/	909	1,137,026	507,227	386,863	290,758	243,310	2,681,511	-

1/ Output of one mill in Inyo County combined with Alpine County production.
2/ Output of one mill in Sacramento County combined with Amador County production.
3/ Included in Table for comparison.

TABLE 10

INDIVIDUAL INCOMES OF CIVILIAN RESIDENTS OF COUNTIES IN SAN JOAQUIN RIVER BASIN

(Data from Report No. 11, Preliminary Economic Survey, Series 1950-51, California State Chamber of Commerce)

Counties Lying Wholly Within Basin

Name	Income - 1940	Income*-1949	%Area in Basin	% Change from 1940
Madera	12,520,000	42,335,000	100	238.1
Merced	28,184,000	87,864,000	100	211.8
San Joaquin	90,218,000	298,900,000	100	231.3
Stanislaus	48,619,000	163,212,000	100	235.7
Calaveras	5,399,000	12,963,000	100	140.1
Mariposa	3,362,000	8,006,000	100	138.1
Tuolumne	7,761,000	17,857,000	100	130.1

Counties of Which a Part Lies Within the Basin

Name	Income - 1940	Income* - 1949	% Area in Basin	% Change from 1940
Alameda	456,754,000	1,326,222,000	10	190.4
Contra Costa	73,723,000	304,154,000	39	312.6
San Benito	8,278,000	21,594,000	25	160.9
Sacramento	136,158,000	441,515,000	50	224.3
El Dorado	7,975,000	21,887,000	29	175.1
Fresno	105,170,000	376,108,000	44	257.6
Alpine	344,000	550,000	32	65.0
Amador	5,509,000	15,581,000	98	183.5
State of California**		16,960,800,000	-	285.6

* Preliminary estimate by Research Dept., California State Chamber of Commerce

** Added to Table for comparison.